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**STATE OF TEXAS  
DEPARTMENT OF TRANSPORTATION**

**PLANS OF PROPOSED  
STATE HIGHWAY IMPROVEMENT**

FEDERAL AID PROJECT NO.

STP 2022(407)HES

**BOWIE COUNTY**

NET LENGTH OF PROJECT= 2640 FT. = 0.500 MI.

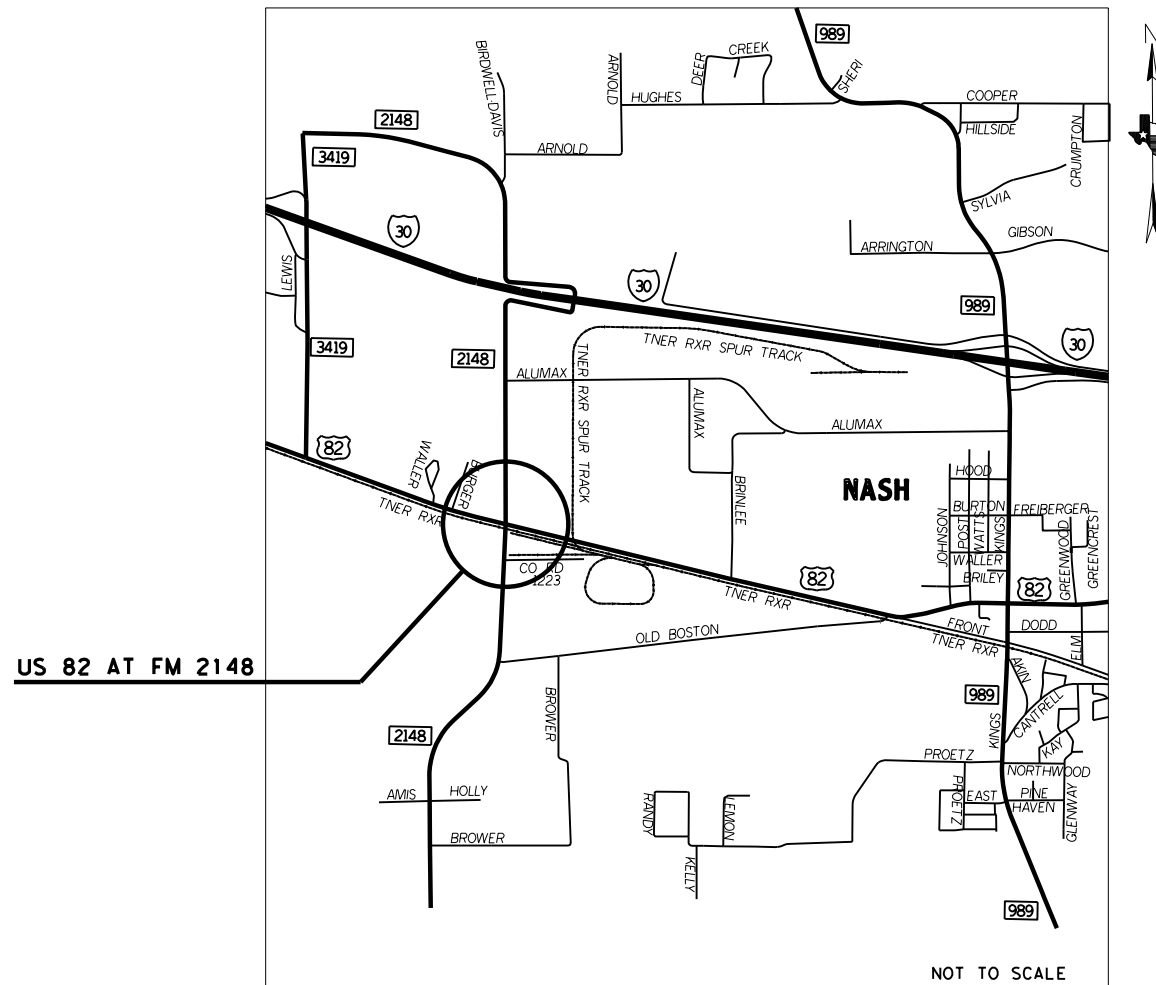
LIMITS: US 82 AT FM 2148

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENTS

CONSISTING OF INSTALL TRAFFIC SIGNAL, INSTALL ADVANCE WARNING SIGNALS AND SIGNS (INTERSECTION), SAFETY LIGHTING, TRANSVERSE RUMBLE STRIPS

THE CONTRACTOR SHALL MAKE HIS OWN INVESTIGATIONS AND ARRANGEMENTS FOR DELIVERY OF MATERIALS.

REQUIRED SIGNS SHALL BE IN ACCORDANCE WITH THE CURRENT BARRICADE AND CONSTRUCTION OR BC SHEETS AND THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".



EXCEPTIONS: NONE  
EQUATIONS: NONE  
RAILROAD CROSSINGS: TWO  
TEXAS NORTHEASTERN RAILROAD - DOT # 795838D  
TEXAS NORTHEASTERN RAILROAD - DOT # 795836P

FEDERAL AID PROJECT NO.			
STP 2022(407)HES			
CONT	SECT	JOB	HIGHWAY
0046	06	082	US 82
DIST	COUNTY		SHEET NO.
ATL	BOWIE		1

FINAL PLANS

LETTING DATE: \_\_\_\_\_

DATE CONTRACTOR BEGAN WORK: \_\_\_\_\_

DATE WORK WAS COMPLETED & ACCEPTED: \_\_\_\_\_

FINAL CONTRACT COST: \$ \_\_\_\_\_

CONTRACTOR : \_\_\_\_\_

CONTRACTOR ADDRESS: \_\_\_\_\_

LIST OF APPROVED FIELD CHANGES: \_\_\_\_\_

THE CONSTRUCTION WORK WAS PERFORMED IN SUBSTANTIAL COMPLIANCE WITH THE CONTRACT.

P. E.

DATE



12/6/2021

RECOMMENDED FOR LETTING: \_\_\_\_\_

*Rebecca Wells, P.E.*

DIRECTOR OF TRANSPORTATION OPERATIONS

RECOMMENDED FOR LETTING: 12/22/2021

DocuSigned by:  
*Deanne Simmons, P.E.*  
929084EF4AF345A...  
DISTRICT DIRECTOR OF TRANSPORTATION  
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 12/22/2021

DocuSigned by:  
*Joe H. Wells, P.E.*  
0EAA5DC25F0F45E...  
DISTRICT ENGINEER

DATE: 12/6/2021 4:13:17 PM  
FILE: I:\engdot\Traffic\GND\192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082\_US\_82\_of\_FM\_2148\_Title\_Sheets.dgn  
COUNTY: BOWIE PROJ. NO. \_\_\_\_\_  
HWY. NO.: US 82 LETTING DATE: MARCH, 2022  
DATE ACCEPTED \_\_\_\_\_

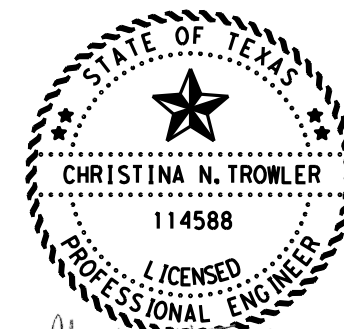
SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, MAY 2012)

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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED WITH A POUND "#" HAVE BEEN ISSUED BY ME, OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.



*Christina N. Trowler, P.E.*  
12/06/2021

## INDEX OF SHEETS

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FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
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STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	

**GENERAL NOTES:**

**General Requirements and Covenants:**

Catalog numbers or trade names of any manufacturer for any part of the installation shown on these plans, are for the purpose of identification only. Furnish manufacturer's materials that are of equal quality and comply with the specifications for this project.

Contractor questions on this project are to be emailed to the following individuals:

*Rebecca L. Wells, P.E.* – Director of Transportation Operations  
Rebecca.wells@Txdot.gov  
*Christina N. Trowler, P.E.* – District Traffic Engineer  
Christina.trowler@Txdot.gov

Contractor questions will be accepted through email, phone, and in person by the above individuals.

All contractor questions will be reviewed by the Engineer. Once a response is developed, it will be posted to TxDOT's Public FTP at the following Address:

<https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/>

All questions submitted that generate a response will be posted through this site. The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process any or all contracts.

Notify the Engineer or his representative by 8:15 a.m. on any day when working in the District.

Clean up and remove all loose material resulting from contract operations each day before work is suspended for that day.

Repair all pavement damaged by the Contractor's forces during construction. Such repair is to be considered incidental to the various bid items in the project and must be approved by engineer.

**ITEM 5 – Control of the Work:**

It is the Contractor's responsibility to verify the accuracy of any department provided control points prior to use.

Contact all utility companies for the exact location of underground utilities before boring, trenching or any other work that might interfere with or damage existing utilities.

Repair any damage caused to utilities by Contractor operations at own expense and restore service in a timely manner.

Work on any project will not be accepted until all components have been shown to be fully operational.

Some of the traffic signal work will be on the Texas Northeastern Railroad right-of-way. The preparing ROW will be on the Texas Northeastern Railroad right-of-way. Protective flagging will be required for this work. Reference Scope of Work Project Specific Details DOT 795838D in the plan set. The work for the East Signal Advance will require preformed in-lane transverse rumble strips, and signal ahead pavement markings to be placed on US 82. It is anticipated that the Contractor will need to set up traffic control thru the crossing to place these and railroad protective flagging will be required for this work. Reference Scope of Work Project Specific Details DOT 795836P in the plan set. Contractor should be able to get off the roadway to do the work to install the signal advance beacons, and electrical service at this location. The Contractor will need to meet all necessary railroad insurance requirements with the Texas Northeastern Railroad. Reference Railroad Scope of Work Project Specific Details in the plan set.

**ITEM 6 - Control of Material:**

When requesting payments for material on hand, contractor's material storage facility will be within the Atlanta District.

A list of pre-qualified products can be found on the internet at <http://www.txdot.gov/business/resources/producer-list.html>.

**ITEM 7 – Legal Relations and Responsibilities:**

This project is considered a maintenance activity and is exempt from the Construction General Permit (CGP) coverage.

Transmit copies of correspondence between Contractor and resource agencies as listed in Article 7.7 "Preservation of Cultural and Natural Resources and the Environment". Work in this contract is required to be done on railroad property. Cooperate with the railroads and comply with all of their requirements including obtaining any training they require before performing work on railroad property.

No significant traffic generator events.

**ITEM 8 – Prosecution and Progress:**

A standard workweek will be used to determine time charges in accordance with Section 8.3.1.4, "Standard Workweek".

Work on the roadway will not begin until thirty (30) minutes after sunrise and will end on the roadway by thirty (30) minutes before sunset or as directed by the Engineer.

**Control:** 0046-06-082  
**County:** Bowie  
**Highway:** US 82

Sheet:

Provide progress schedules meeting the requirements of Section 8.5.2 in 2014 Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges.

Refer to SP 008-004 (120 days) for additional information regarding beginning of working day charges. The reason for the delay is to allow for ordering of materials.

**ITEM 9 – Measurement and Payment:**

For all pay items, a daily email will be sent to the inspector with the item number, quantity, and location description.

**ITEM 100 – Preparing Right of Way:**

Clearing will be performed by mechanical equipment, such as tracked mulching tractors, that will minimize ground disturbance. Produce a wood-chip derived from the trunks and branches of trees, shrubs, and other vegetation cleared. Any merchantable chips may be removed and become the property of the Contractor. Any chipped or mulched material left on the ROW shall not exceed 6 inches by 3 inches in size. Trees will be cut and removed of mulched without the stumps or roots being disturbed to prevent ground disturbance. Tree and brush stumps will be severed or ground flush with the natural ground in a way that allows the Prep ROW limits to be mowed in the future. Any wood-chip mulch produced (and not hauled off of right of way) will be evenly spread across the area being cleared. Spread mulch over cleared area not exceeding a depth of 6 inches.

Merchantable timber and woodchips in the clearing area may be removed only if ground conditions are suitable to prevent rutting and significant soil disturbance of the right of way.

Smooth any ruts/disturbance in the clearing area to match original ground conditions. Every precaution will be taken and proper equipment utilized to prevent timber from falling on Railroad track, and TXDOT roadway.

Due to limited work area at this location between the roadway and the railroad track the Contractor will need to make arrangements to not leave equipment parked on site as the removal is taking place. This is necessary to make sure equipment is not left in close proximity to the railroad tracks, and to ensure that no equipment is left 30 feet from the travel lane of the roadway.

Railroad protective flagging is required for all removal work. No work will take place unless protective flagging is in place. Contractor needs to ensure work will not cause disruptions on the roadway (US 82), and the Railroad. Recommend that the Contractor look at the location and submit a plan to the Engineer prior to the work showing the sequence of the removal work, and equipment to be used for this removal work for approval.

**Control:** 0046-06-082  
**County:** Bowie  
**Highway:** US 82

Sheet: 3A

**ITEM 162 & 164 – Sodding and Seeding for Erosion Control:**

PERMANENT PLANTING MIXTURE  
Species and Rates  
(lb. PLS/ac.)

(Season: February 1 to May 15)

Green Sprangletop	0.4
Bermudagrass	2.4
Sand Lovegrass	1.0
Lance-Leaf Coreopsis	1.25

(Season: September 1 to November 30)

Bermuda (Unhulled)	12
Crimson Clover	10

**TEMPORARY SEEDING FOR EROSION CONTROL**

Warm Season  
(Season: May 15 to August 31)

Bermudagrass	6
Foxtail Millet	34

Cool Season  
(Season: September 1 to November 30)

Tall Fescue	4.5
Oats	24
Wheat	34

Adjust the seeding mixture and rates if directed.

Inoculate crimson clover seed with a legume inoculant. Sow inoculated seed dry, with either hand operated or mechanical equipment, after the fertilizer is placed.

Do not use Bahiagrass.

Finish slopes with a tracked vehicle running vertically up and down the slope.

Use crimper immediately after spreading mulch. Apply ballast to machine to achieve an anchoring depth of 2 to 3 inches to form soil-binding mulch and to prevent loss or bunching of the mulch by wind. Anchor the machine to prevent the formation of ridges and ruts. Use coulters at least ten inches in diameter. Traverse slopes horizontally. The number of passes needed, not



to exceed three, will be as directed. In areas where an anchoring machine cannot be used, the Department will require a tacking agent be used in the mulch as directed.

Use broadcast seeding for temporary erosion control, when and as directed. This will not be paid for directly but is subsidiary to the various bid items.

Use additional temporary seeding if permanent seeding is placed outside the optimum growing season shown for this item, if directed.

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 "Roadside Mowing" except for measurement and payment. This work will be subsidiary to pertinent bid items. Repair mulch sod, damaged by causes other than the Contractor's operations, as directed using mulch sod, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

**ITEM 166 - Fertilizer:**

When seeding between September 1 and January 1, place one-half of the amount of fertilizer specified for seeding with the seeds and place the remainder the following spring unless otherwise directed. When seeding is placed between January 1 and June 1, place one-half the amount of fertilizer specified for seeding with the seeds and place the remainder 30 days later unless otherwise directed.

**ITEM 416 – Drilled Shaft Foundations:**

Foundation locations will be staked by the Contractor. The Engineer will be given a minimum of 3 days advance notice to ensure placement is in the proposed design location. Chamfer or tool exposed edges or joints of concrete as directed.

**ITEM 420 – Concrete Substructures:**

Chamfer or tool exposed edges or joints of concrete as directed.

**ITEM 421 – Hydraulic Cement Concrete:**

TxDOT will furnish and maintain concrete compressive strength testing equipment.

Elevate beam tanks as directed.

When a curing tank is provided the following information must be provided. All items must always be clearly legible and visible from all directions.

- Post and maintain the message "Caution Lime Solution, Eye and Skin Irritant".

- Provide a copy of the SDS sheet for the lime in use.
- Provide the personal protective equipment (PPE) listed below for Department use only: Face shield, a pair of chemical gloves at least 18 inches in length and a chemical apron. Store the SDS sheet and PPE in a clean dry location adjacent to the curing tank.
- Provide an eye wash station capable of providing a 15-minute flush as required by the United States Occupational Safety and Health Administration (OSHA). The eye wash station shall be located within ten feet of the curing tank. When a tank heater is required ensure that all electrical wiring, receptacles, and devices meet National Electrical Code and Underwriters Laboratories Inc. requirements.

**ITEM 432 - Riprap:**

Provide 1/2" expansion joint material with an area equal to the area of contact between the two concrete surfaces. The joint material will be visually inspected for approval.

**ITEM 502 – Barricades, Signs, and Traffic Handling:**

The Contractor Force Account "Safety Contingency" that has been established for this project is intended to be utilized for work zone enhancements, to improve the effectiveness of the Traffic Control Plan, that could not be foreseen in the project planning and design stage. These enhancements will be mutually agreed upon by the Engineer and the Contractor's Responsible Person based on weekly or more frequent traffic management reviews on the project. The Engineer may choose to use existing bid items if it does not slow the implementation of enhancement.

There may be ongoing contracts on several of the roadways included in this contract. Coordinate work with these projects and consult with the Engineer when developing sequence of work.

The Traffic Control Plan for this contract consists of the installation and maintenance of warning signs and or other traffic control devices shown in the plans, specification data which may be included in the general notes, applicable provisions of the Texas Manual on Uniform Traffic Control Devices (TMUTCD), traffic control plan sheets included in the plans, standard BC sheets and Item 502 of the standard specifications.

The Contractor's responsible person (CRP) will be responsible for ensuring that the signs and traffic control devices are in place and functioning properly in accordance with Article 502.2 of the Standard Specifications.

The CRP will inspect and ensure any deficiencies are corrected each and every day through out the duration of this contract. Notify the Engineer in writing of the name, address, and telephone number of this employee or these employees.

For the traffic control plan sheets when shown in the plans for handling traffic through the work area the signing arrangement and spacing shown may be varied as necessary to fit field conditions; however, any proposed changes in the traffic control plan must be approved by the Engineer prior to implementation.

Restrict the movement of equipment across traffic lanes to an absolute minimum.

All warning signs will be (48 inches x 48 inches) black on orange, factory made and in satisfactory condition.

Strobe lights or flashing lights and back up horns (when applicable and/or as directed by the Engineer) will be installed on all motorized equipment and will be in operation during the time that the equipment is working on or near the road surface.

A Type B flashing arrow panel will be required on this project when a lane of traffic is to be closed for any duration of time.

Anytime equipment encroaches into a travel lane as shown on WZ BTS and TCP standards shown in this project, the Contractor will be required to have at least one shadow vehicle with a truck mounted attenuator as directed.

Install temporary rumble strips in accordance with WZ(RS) whenever short duration stationary lane closures are in place and workers are present.

Notify inspector prior to any planned lane closures. Lane closures must be entered in the HCR (Highway Condition Report) 48 hours prior to beginning work.

All flaggers will be properly attired, orange or fluorescent type III vests and white hard hats are required. Proper flagging procedures must be demonstrated by all workers in accordance with the "Texas Manual on Uniform Traffic Control Device." A list of all qualified flaggers will be furnished by the Contractor before beginning work. This list will be updated as flaggers become qualified.

Provide flaggers at the ends of work areas and at all other points of conflict with roadway machinery and roadway traffic when and as directed.

No equipment will be left within 30 feet of the travel way. Equipment and/or obstructions within 30 feet of the travel way will be removed or clearly marked by warning lights and barricades, as directed.

Maintain access to abutting property at all times using approved materials and methods. Work required to maintain ingress and egress within the limits of this project will not be paid for directly, but is subsidiary to the pertinent bid items. Provide for traffic safety and for the ingress and egress to public and private property in work areas at all times during the construction of this project.

Place construction fencing a minimum of 4 feet high around bore pits open over night for pedestrian safety. Use appropriate post to install fencing around open pits, do not use equipment as part of post or fencing system.

The existing number of lanes open to traffic will not be reduced except that lane closures will be required on high speed roadways for all short term/short duration work that requires a vehicle to be in the roadway or as directed.

In urban areas and high speed areas the contractor will be required to set up full lane closures when working at intersections as directed by the Engineer.

With reference to WZ (BTS-1), typical hanging signal installations, the Contractor may be required to close a traffic lane(s) as directed.

Maintenance of driveways and intersections will not be paid for directly but is subsidiary to the pertinent bid items.

**ITEM 506 – Temporary Erosion, Sedimentation, and Environmental**

**Controls:**

Place erosion or pollution control measures deemed necessary by the Engineer. Work performed for which there is no applicable pay items in the contract will be reimbursed in accordance with Article 9.7, "Payment for Extra Work and Force Account Method".

**ITEM 610 – Roadway Illumination Assemblies:**

Luminaire foundations will require an apron as directed by the Engineer as shown on standard RID(2)-20.

There will not be any stock piles on the job site from illumination installations. Remove any additional soil, rock, and concrete from job site the same day that they are produced.

**ITEM 618 – Conduit:**

When the specifications for electrical items require UL listed products, it will be understood to mean UL listed or Any Nationally Recognized Testing Lab (NRTL).

Aluminum conduit is acceptable for this project where rigid metal conduit is used. Aluminum conduit specification will be submitted to the Engineer for approval. The aluminum conduit will be new and unused and UL-Listed. Notify the Engineer that aluminum conduit will be used on this project. Aluminum conduit will be installed, measured, and paid for under item 618.

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet:

Install a continuous bare or green insulated copper wire, No. 6 awg or larger, except where shown on the plans, in the conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

The locations of conduit as shown are for diagrammatic purposes only and may be varied to meet local conditions, subject to approval.

All conduit placed under existing pavement will be bored as directed. Cutting, trenching or jacking across roadways or driveways will not be permitted without approval.

Install a 3-inch warning tape on trenched conduit runs during backfill operations. The tape will be red polyethylene marked "CAUTION-BURIED ELECTRIC LINE". Place the tape 12 inches above the conduit. Measurement and payment are subsidiary to Item 618, "Conduit".

When backfilling bore pits, ensure the conduit does not become damaged. Place select backfill in three equal lifts to the bottom of the conduit or place sand to a point 2 inches above the conduit. Compact the backfill to obtain a density equal to the existing, adjacent soil. Prevent backfill material from entering the conduit.

Excavate bore pits no closer than 2 feet from the edge of pavement or base.

The vertical and horizontal tolerances of bored conduits are not to exceed 18 inches as measured from the target point.

Ensure that all PVC conduit and fittings will be schedule 40.

Bell end fittings will be used at the ends of all non-metallic conduits. (e.g., metal junction box).

Where PVC, duct cable, and HDPE conduit 1" and larger is allowed and installed as per TxDOT standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Detail Standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which is connected. Ensure only a flat, high tensile strength polyester fiber pull tape is used for pulling conductor through the PVC conduit system.

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet: 3D

### **ITEM 620 – Electrical Conductors:**

Grounding conductors sharing the same conduit, junction box, ground box or structure will be bonded together at accessible points in accordance with the current edition of the National Electrical Code.

Complete splices using approved splicing methods and insulate with an approved thermosetting compound, heavy duty heat shrinkable tubing with sealant, or heat shrinkable tape with sealant suitable for outdoor use.

Electrical certification for this project will be as per Item 7 of the current Texas Standard Specifications and any special provisions to Item 7.

For both transformer and shoe-base type illumination poles, provide double-pole breakaway fuse holder as shown on the Texas Department of Transportation (TxDOT) materials producers list. Category is "Roadway Illumination and Electrical Supplies". Fuse holder is shown on list under Items 610 and 620. Provide 10-amp time delay fuses.

When the specifications for electrical items require UL listed products, it will be understood to mean UL listed or Any Nationally Recognized Testing Lab (NRTL).

Aluminum conduit is acceptable for this project where rigid metal conduit is used. Aluminum conduit specification will be submitted to the Engineer for approval. The aluminum conduit will be new and unused and UL-Listed. Notify the Engineer that aluminum conduit will be used on this project. Aluminum conduit will be installed, measured, and paid for under item 618.

Install a continuous bare or green insulated copper wire, No. 6 awg or larger, except where shown on the plans, in the conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

The locations of conduit as shown are for diagrammatic purposes only and may be varied to meet local conditions, subject to approval.

All conduit placed under existing pavement will be bored as directed. Cutting, trenching or jacking across roadways or driveways will not be permitted without approval.

Install a 3-inch warning tape on trenched conduit runs during backfill operations. The tape will be red polyethylene marked "CAUTION-BURIED ELECTRIC LINE". Place the tape 12 inches above the conduit. Measurement and payment is subsidiary to Item 618, "Conduit".

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet:

When backfilling bore pits, ensure the conduit does not become damaged. Place select backfill in three equal lifts to the bottom of the conduit or place sand to a point 2 inches above the conduit. Compact the backfill to obtain a density equal to the existing, adjacent soil. Prevent backfill material from entering the conduit.

Excavate bore pits no closer than 2 feet from the edge of pavement or base.

The vertical and horizontal tolerances of bored conduits are not to exceed 18 inches as measured from the target point.

Ensure that all PVC conduit and fittings will be schedule 40.

Bell end fittings will be used at the ends of all non-metallic conduits. (e.g., metal junction box).

Where PVC, duct cable, and HDPE conduit 1" and larger is allowed and installed as per TxDOT standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Detail Standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which is connected. Ensure only a flat, high tensile strength polyester fiber pull tape is used for pulling conductor through the PVC conduit system.

### **ITEM 624 – Ground Boxes:**

Locations of ground boxes are approximate. Final locations will be as approved.

Ground boxes will require an apron as directed by the Engineer as shown on standard ED (4).

When ground boxes are placed in existing concrete sidewalk, saw cut sidewalk and repair any damage to the surrounding concrete. This work will not be paid for separately but considered subsidiary to this item.

### **ITEM 628 – Electrical Services:**

The power company will connect the power to the service lines at the weather heads and will furnish and install meters.

Make arrangements with the appropriate electric power company to provide electric service. Notify the electric power company at least 3 weeks in advance of the need for the service connection. Time suspension will not be issued to Contractor for awaiting utility service connection. For this project, the power company is AEP for all three proposed services.

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet: 3E

Construct the proposed electrical service as shown on Electrical Detail (ED) as shown in the electrical service summary and in accordance with Item 628, "Electrical Services". Make all arrangements for electrical service and comply with local standards and practices for proper installation.

Foundations for the two overhead proposed electrical services will be 30-A. Foundations will not be paid for separately, but will be subsidiary to Item 628. Foundation depth for these services will be six feet.

Concrete rip rap service pads will be constructed for the two overhead proposed electrical services on the Advance Warning Signs. Concrete rip rap for the service pads will be paid for under Item 432. The underground pedestal service will be mounted on the signal controller pad as shown on the Signal Details, Modified Controller Slab Detail. The concrete rip rap for the pad is subsidiary to Item 680.

Make all arrangements for electrical service and comply with local standards and practices for proper installation

When the specifications for electrical items require UL listed products, it will be understood to mean UL listed or Any Nationally Recognized Testing Lab (NRTL).

Aluminum conduit is acceptable for this project where rigid metal conduit is used. Aluminum conduit specification will be submitted to the Engineer for approval. The aluminum conduit will be new and unused and UL-Listed. Notify the Engineer that aluminum conduit will be used on this project. Aluminum conduit will be installed, measured, and paid for under item 618.

Install a continuous bare or green insulated copper wire, No. 6 awg or larger, except where shown on the plans, in the conduit throughout the electrical system in accordance with the electrical detail sheets, and the latest edition of the National Electrical Code.

The locations of conduit as shown are for diagrammatic purposes only and may be varied to meet local conditions, subject to approval.

All conduit placed under existing pavement will be bored as directed. Cutting, trenching, or jacking across roadways or driveways will not be permitted without approval.

Install a 3-inch warning tape on trenched conduit runs during backfill operations. The tape will be red polyethylene marked "CAUTION-BURIED ELECTRIC LINE". Place the tape 12 inches above the conduit. Measurement and payment are subsidiary to Item 618, "Conduit".

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet:

When backfilling bore pits, ensure the conduit does not become damaged. Place select backfill in three equal lifts to the bottom of the conduit or place sand to a point 2 inches above the conduit. Compact the backfill to obtain a density equal to the existing, adjacent soil. Prevent backfill material from entering the conduit.

Excavate bore pits no closer than 2 feet from the edge of pavement or base.

The vertical and horizontal tolerances of bored conduits are not to exceed 18 inches as measured from the target point.

Ensure that all PVC conduit and fittings will be schedule 40.

Where PVC, duct cable, and HDPE conduit 1" and larger is allowed and installed as per TxDOT standards, provide a PVC elbow in place of the galvanized rigid metal elbow required by the Electrical Detail Standards. Ensure the PVC elbow is of the same schedule rating as the conduit to which is connected. Ensure only a flat, high tensile strength polyester fiber pull tape is used for pulling conductor through the PVC conduit system. Bell end fittings will be used at the ends of all non-metallic conduits. (e.g., metal junction box).

#### **ITEM 636 - Signs:**

Ensure the location and details of the fabrication, assembly and erection of the aluminum signs are in accordance with the details shown on the plans.

Ensure the Contractor's working drawings, for extruded aluminum signs; conform to the details shown on the plans.

Transport signs in such a manner as to not damage the high intensity reflective sheeting. Carry signs in a standing position within a divider rack assembly.

The two Signal Advance Signs on US 82 will require edge moulding as shown on the Advance Warning Beacon and Sign Typical Details. Edge moulding will be subsidiary to this Item. Install sign clamps on the signs before the installation of the edge moulding.

#### **ITEM 644 – Sign Identification Decals:**

Type A signs will be made of flat aluminum.

Existing sign assemblies will be removed after the proposed sign is installed. Contractor will leave existing sign in place while proposed sign goes up. The existing sign will be removed immediately after the proposed sign is installed.

**Control:** 0046-06-082

**County:** Bowie

**Highway:** US 82

Sheet: 3F

Erect the proposed signs an appropriate distance from adjacent signs in accordance with the Texas MUTCD, as directed and as shown on the plans.

Verify the elevation difference between the edge of the travel lane and bottom of the sign.

Do not remove existing sign assemblies until signs are ready to be installed on new mounts.

#### **ITEM 668 – Prefabricated Pavement Marking:**

Prefabricated Pavement Markings will be placed at locations as directed.

#### **ITEM 677 – Eliminating Existing Pavement Markings and Markers:**

Prefab stop bars, 8" pavement markings, and 4" pavement markings will need to be removed on this project. Due to this location being a seal coat surface grinding method, and water blasting will damage the roadway surface. Removal at this location will be accomplished by covering the markings with black prefab Type C pavement markings. This work will be paid for under this item.

#### **ITEM 680 – Highway Traffic Signals:**

The intent of the plans is to provide for a complete signal, installed, connected, tested and ready for operation. Perform, install or furnish the work, materials and services, not expressly identified in the specifications or shown on the plans, which may be necessary for a complete, and properly operating signal system.

The Contractor will be responsible for adjustments in project construction which may be needed because of conflicts with utilities. In addition to calling for dig tests at all locations shown on the plans, contact the Atlanta District Headquarters signal shop at least 2 weeks in advance of work at the proposed locations. A representative from the signal shop will verify that no existing TXDOT electrical systems will interfere with the proposed work.

The existing signal system will remain in operating order until the new system is in place and properly operating.

Cover new signal heads so that the faces cannot be seen from the time of installation until the signals are placed in operation. Burlap, trash bags, paper, etc. will not be acceptable for use in covering signal heads. Signal head covers will be made of out-door fabric which will be weather resistant and it will have straps made of the same material to secure them to the signal head. Signal head covers will be provided by the Contractor and will remain the property of the Contractor upon completion of the contract. All covers will be approved by the Engineer prior to installation.

At the intersection, a modified controller pad is to be constructed. This work will not be paid for directly but will be considered subsidiary to this Item.

Maintain the integrity and function of each existing signalized intersection. Once the integrity or function of the signal has been altered by the Contractor, it will be the Contractor's responsibility to continue work at that location without delay or interruption until operation is restored to the original or proposed operational design, unless otherwise shown on plan sheets.

Each pole foundation will have two 2 inch rigid PVC conduits stubbed out. The stub-outs will be in the direction of each adjacent street or when the traffic signal pole is located in a concrete directional island or sidewalk, terminated in the nearest ground box. This will not be paid for directly; but will be considered subsidiary to this item.

Provide dampening devices for mast arms 40' or greater.

Staking will be done by the Contractor subject to the approval in the field.

Use 10-foot ground rods on pedestal services.

Use aluminum tie wire to wrap signal cable and drip loops to messenger cable or signal pole arms. Aluminum tie wire will be wrapped and tied in a neat clean workmanship manner. Zip ties and electrical tape will not be permitted.

Electric meters will be equipped with a meter bypass to allow for access to the meter without disrupting service to the signals.

Traffic controller assemblies will be furnished by the Department. Notify the Engineer of the need for the controllers at least 5 working days prior to the proposed installation date. Transport the controllers from the Atlanta District Headquarters at 701 E. Main Street, Atlanta, Texas to the job site.

The controller pad at this intersection will be oversized. This work will not be paid for directly; but will be considered subsidiary to this item.

Provide a complete signal, installed, connected, tested and ready for operation. Perform, furnish or properly install all work, materials and services not expressly called for in the specifications or shown on the plans, which is necessary for a complete and properly operating signal system. The additional work and materials will not be paid for directly, but are subsidiary to the pertinent bid items.

Police enforcement will be used to control traffic at intersections as directed by the engineer and paid by invoice to the cities, in accordance with Section 9.7.1.6.

Repair topsoil, damaged by Contractor's operations at intersections, as directed using topsoil, sod, and fertilizer to bring the disturbed area back to its preexisting condition. This work will be considered subsidiary to Item 680 and will not be paid for separately.

When the Engineer finds it necessary to install erosion control due to contractors soil disturbing activities, contractor will reference state standard EC(1), Temporary Erosion, Sediment, and.

Use properly sized self-insulated solderless fork terminals when terminating signal conductors on a terminal strip in the signal system. Attach terminals to the wires with a ratchet-type compression crimping tool properly sized to the wire.

The Contractor will not put signals in operation. Authorized TXDOT personnel must be onsite for controller start up.

There will not be any stock piles on the job site from signal, illumination, or DMS installations. Remove any additional soil, rock, and concrete from job site the same day that they are produced.

Other traffic signal materials salvaged from this project will become the property of the Contractor. Remove these salvaged materials from the project and dispose of in accordance with all applicable State and Local laws and regulations.

Remove and dispose of all existing ground boxes once the new signal intersection is functional. Backfill all disturbed areas where ground boxes have been removed. Patch any concrete or hot mix that was disturbed by ground box removal. Ground box removal and concrete or hot mix patching will be subsidiary to item 680.

**ITEM 682 - Vehicle and Pedestrian Signal Heads:**

For this project, all signal advance installations requiring 1-section backplates will be plastic with no reflective border. The 3-section, and 5-section backplates for the signal heads on the traffic signal will be vented aluminum and require a 2-wide fluorescent yellow AASHTO Type Bfl or Cfl retroreflective border conforming to TXDOT DMS-8300. Refer to standard sheet TS-BP-20 for details.

Signal head and backplate compatibility must be verified by the Contractor prior to installation.

**ITEM 685 – Roadside Flashing Beacon Assemblies:**

Furnish flasher cabinets as called for under this item.

All signs to be mounted will be furnished by the Contractor. The Contractor will supply all edge molding, bolts, rivets, screws, fasteners, stiffeners, clamps, brackets, sign support connections and any tools or incidentals needed to mount the aluminum signs. This work will not be paid for separately; but will be subsidiary to this item.

Signs will be transported by the Contractor to the job site in such a manner as not to damage any sheeting. Carry signs in a standing position within a divider rack assembly.

Provide single-pole breakaway disconnects. Use Bussman HEBW, Littlefuse LEB, Ferraz-Shawmut FEB, or equal on ungrounded conductors. For all grounded conductors use Bussman



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HET, Lillefuse LET, or Ferraz-Shawmut FEBN, or equal. These breakaway connectors have a white colored marking and a permanently installed solid neutral.

Foundations for pedestal pole assemblies used for the signal advance warning will be screw-in type foundations as detailed in RFBA-13.

The signal advances for US 82 will require a two pole ped pole installation refer to Advance Warning Beacon and Sign Typical Detail Sheet. One ped pole and one foundation are subsidiary to Item 685. The second ped pole will be paid for under Item 687, and the second foundation subsidiary to Item 687.

**ITEM 686 – Traffic Signal Pole Assemblies (Steel):**

Each pole foundation will have two spare 2 inch rigid PVC conduits stubbed out. Align stub outs in the direction of each adjacent street, or as directed.

**ITEM 6001 – Portable Changeable Message Sign:**

Locations of the message boards will be approved by the Engineer or their representative prior to be setting out. Messages will be provided by the Engineer and be paid by the number of days used displaying messages for each.

For this two message boards will be placed on US 82 for 7 days prior to the work to give the traveling public notice prior to the signal being activated. Once the traffic signal is activated the Contractor will change the message on both message boards as directed by the Engineer and leave in place for 10 days.

**Item 6056 – Preformed In-Lane (Transvers)/Centerline Rumble Strips:**

Supply all equipment and materials necessary for placement of In-Lane or Transverse Rumble Strips.

Do not place pavement markings until rumble strips are accepted by written acceptance.

**ITEM 6185–Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA):**

A total of one (1) shadow vehicle with TMA will be required for work. The Contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMA's needed for the project.

**ITEM 6306 – Video Imaging Vehicle Detection System:**

The Contractor will provide primary communication cable as describe below:

Attention is directed to the fact that the primary communication cable installed between the sensor units and the processor unit will be Cat 5 Cable.

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County: Bowie

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All connections cables run from the equipment cabinet to the cameras will be continuous without splices from terminal point to terminal point.

Attention is called to the fact that TXDOT will provide all camera components and mounting hardware for this project. The Contractor will be responsible for providing and installing the Cat 5 cable and mounting each camera and connecting the cable to each camera.

**BASIS OF ESTIMATE**

ITEM	DESCRIPTION	RATE	UNIT	QUANTITY
*166	Fertilizer (13-13-13)	300 lb./5,000 sq. yd. of Seed	ton	.21

\*FOR CONTRACTOR'S INFORMATION ONLY.



CONTROLLING PROJECT ID 0046-06-082

DISTRICT Atlanta  
HIGHWAY US 82

COUNTY Bowie

# Estimate & Quantity Sheet

CONTROL SECTION JOB				0046-06-082		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00066607			
COUNTY				Bowie			
HIGHWAY				US 82			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	100-6001	PREPARING ROW	AC	1.000		1.000	
	164-6009	BROADCAST SEED (TEMP) (WARM)	SY	1,089.000		1,089.000	
	164-6011	BROADCAST SEED (TEMP) (COOL)	SY	1,089.000		1,089.000	
	164-6054	BOND FBR MTRX SEED (PERM)(RURAL)(SAND)	SY	4,840.000		4,840.000	
	168-6001	VEGETATIVE WATERING	MG	104.500		104.500	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	20.000		20.000	
	416-6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	23.000		23.000	
	416-6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	40.000		40.000	
	432-6006	RIPRAP (CONC)(CL B)	CY	2.000		2.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	4.000		4.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	104.000		104.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	104.000		104.000	
	610-6288	IN RD IL (TY SA) 50T-10 (400W EQ) LED	EA	2.000		2.000	
	618-6023	CONDT (PVC) (SCH 40) (2")	LF	294.000		294.000	
	618-6024	CONDT (PVC) (SCH 40) (2") (BORE)	LF	115.000		115.000	
	618-6033	CONDT (PVC) (SCH 40) (4")	LF	40.000		40.000	
	618-6034	CONDT (PVC) (SCH 40) (4") (BORE)	LF	73.000		73.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	1,075.000		1,075.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	1,426.000		1,426.000	
	620-6012	ELEC CONDR (NO.4) INSULATED	LF	120.000		120.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	2.000		2.000	
	624-6009	GROUND BOX TY D (162922)	EA	2.000		2.000	
	624-6010	GROUND BOX TY D (162922)W/APRON	EA	4.000		4.000	
	628-6002	REMOVE ELECTRICAL SERVICES	EA	1.000		1.000	
	628-6164	ELC SRV TY D 120/240 070(NS)AL(E)PS(U)	EA	1.000		1.000	
	628-6307	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	EA	2.000		2.000	
	636-6002	ALUMINUM SIGNS (TY G)	SF	72.000		72.000	
	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	18.000		18.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	1.000		1.000	
	644-6071	RELOCATE SM RD SN SUP&AM TY TWT	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	2.000		2.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	76.000		76.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	2.000		2.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	5.000		5.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	207.000		207.000	
	677-6003	ELIM EXT PAV MRK & MRKS (8")	LF	20.000		20.000	

DISTRICT	COUNTY	CCSJ	SHEET
Atlanta	Bowie	0046-06-082	4



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0046-06-082

DISTRICT Atlanta  
HIGHWAY US 82

COUNTY Bowie

CONTROL SECTION JOB				0046-06-082		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00066607			
COUNTY				Bowie			
HIGHWAY				US 82			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	49.000		49.000	
	680-6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1.000		1.000	
	682-6001	VEH SIG SEC (12")LED(GRN)	EA	12.000		12.000	
	682-6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2.000		2.000	
	682-6003	VEH SIG SEC (12")LED(YEL)	EA	16.000		16.000	
	682-6004	VEH SIG SEC (12")LED(YEL ARW)	EA	2.000		2.000	
	682-6005	VEH SIG SEC (12")LED(RED)	EA	12.000		12.000	
	682-6021	BACK PLATE (12")(1 SEC)	EA	4.000		4.000	
	682-6054	BACKPLATE W/REF BRDR(3 SEC)(VENT)ALUM	EA	10.000		10.000	
	682-6056	BACKPLATE W/REF BRDR(5 SEC)(VENT)ALUM	EA	2.000		2.000	
	684-6008	TRF SIG CBL (TY A)(12 AWG)(3 CONDR)	LF	118.000		118.000	
	684-6010	TRF SIG CBL (TY A)(12 AWG)(5 CONDR)	LF	1,468.000		1,468.000	
	684-6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	441.000		441.000	
	684-6015	TRF SIG CBL (TY A)(12 AWG)(10 CONDR)	LF	226.000		226.000	
	685-6001	INSTALL RDSB FLASH BEACON ASSEMBLY	EA	2.000		2.000	
	686-6029	INS TRF SIG PL AM (S)1 ARM(28')	EA	2.000		2.000	
	686-6037	INS TRF SIG PL AM(S)1 ARM(36')	EA	2.000		2.000	
	686-6049	INS TRF SIG PL AM(S)1 ARM(48')	EA	1.000		1.000	
	687-6001	PED POLE ASSEMBLY	EA	2.000		2.000	
	6001-6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	34.000		34.000	
	6056-6001	PREFORMED IN-LANE(TRANS) RUMBLE STRIP	LF	160.000		160.000	
	6058-6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.000		1.000	
	6089-6002	CAT 5 ETHERNET CABLE	LF	1,248.000		1,248.000	
	6185-6002	TMA (STATIONARY)	DAY	45.000		45.000	
	6306-6010	VIVDS CAM ASSY (INSTALL ONLY)	EA	5.000		5.000	
	11	STATE FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
	12	RAILROAD FLAGGING: RAILROAD FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

FILE: T:\engdata\Traffic\DN\d192515 Jamie\JOBS\SAFETY PROJECTS\CSJ 0046-06-082 US 82 at FM 2148\sum.dgn  
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ITEM NO.	DESC CODE	DESCRIPTION	UNIT	Project	
				US 82 AT FM 2148	Totals
0100	6001	PREPARING ROW	AC	1.00	1.00
0164	6009	BROADCAST SEED (TEMP) (WARM)	SY	1089.00	1089.00
0164	6011	BROADCAST SEED (TEMP) (COOL)	SY	1089.00	1089.00
0164	6054	BONDED FBR MTRX SEED (PERM)(RURAL)(SAND)	SY	4840.00	4840.00
0168	6001	VEGETATIVE WATERING	MG	104.50	104.50
0416	6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	20.00	20.00
0416	6031	DRILL SHAFT (TRF SIG POLE) (30 IN)	LF	23.00	23.00
0416	6032	DRILL SHAFT (TRF SIG POLE) (36 IN)	LF	40.00	40.00
0432	6006	RIP RAP (CONC) (CL B)	CY	2.00	2.00
0506	6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	104.00	104.00
0506	6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	104.00	104.00
0610	6288	IN RD IL (TY SA) 50T-10 (400W EQ) LED	EA	2.00	2.00
0618	6023	CONDUIT (PVC)(SCH 40)(2")	LF	294.00	294.00
0618	6024	CONDUIT (PVC)(SCH 40)(2")(BORE)	LF	115.00	115.00
0618	6033	CONDUIT (PVC)(SCH 40)(4")	LF	40.00	40.00
0618	6034	CONDUIT (PVC) (SCH 40) (4") (BORE)	LF	73.00	73.00
0620	6009	ELEC CONDR(NO. 6)BARE	LF	1075.00	1075.00
0620	6010	ELEC CONDR(NO. 6)INSULATED	LF	1426.00	1426.00
0620	6012	ELEC CONDR(NO. 4)INSULATED	LF	120.00	120.00
0624	6002	GROUND BOX TY A (122311) W/ APRON	EA	2.00	2.00
0624	6009	GROUND BOX TY D(162922)	EA	2.00	2.00
0624	6010	GROUND BOX TY D(162922) W/APRON	EA	4.00	4.00
0628	6002	REMOVE ELECTRICAL SERVICES	EA	1.00	1.00
0628	6164	ELC SRV TY D 120/240 070(NS)AL(E)PS(U)	EA	1.00	1.00
0628	6307	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	EA	2.00	2.00
0636	6002	ALUMINUM SIGNS (TY G)	SF	72.00	72.00
0636	6007	REPLACE EXISTING ALUMINUM SIGNS (TY A)	SF	18.00	18.00
0644	6060	IN SM RD SUP&AM TY TWT (1) WS (P)	EA	1.00	1.00
0644	6071	RELOCATE SM RD SN SUP&AM TY TWT	EA	1.00	1.00
0644	6076	REMOVE SM RD SN SUP&AM	EA	2.00	2.00
0668	6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	76.00	76.00
0668	6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	2.00	2.00
0668	6085	PREFAB PAV MRK TY C (W) (WORD)	EA	5.00	5.00
0677	6001	ELIM EXT PAV MRK & MRKS (4")	LF	207.00	207.00
0677	6003	ELIM EXT PAV MRK & MRKS (8")	LF	20.00	20.00
0677	6007	ELIM EXT PAV MRK & MRKS (24")	LF	49.00	49.00
0680	6002	INSTALL HWY TRF SIG (ISOLATED)	EA	1.00	1.00
0682	6001	VEH SIG SEC (12")LED(GRN)	EA	12.00	12.00
0682	6002	VEH SIG SEC (12")LED(GRN ARW)	EA	2.00	2.00
0682	6003	VEH SIG SEC (12")LED(YEL)	EA	16.00	16.00
0682	6004	VEH SIG SEC (12")LED(YEL ARW)	EA	2.00	2.00
0682	6005	VEH SIG SEC (12")LED(RED)	EA	12.00	12.00
0682	6021	BACK PLATE (12") (1 SEC)	EA	4.00	4.00
0682	6054	BACK PLATE/W REF BRDR (3 SEC) (VENT) ALUM	EA	10.00	10.00
0682	6056	BACK PLATE/W REF BRDR (5 SEC) (VENT) ALUM	EA	2.00	2.00
0684	6008	TRF SIG CBL (TY A)(12 AWG)(3 CONDR)	LF	118.00	118.00
0684	6010	TRF SIG CBL (TY A)(12 AWG)(5 CONDR)	LF	1468.00	1468.00
0684	6012	TRF SIG CBL (TY A)(12 AWG)(7 CONDR)	LF	441.00	441.00
0684	6015	TRF SIG CBL (TY A)(12 AWG)(10 CONDR)	LF	226.00	226.00
0685	6001	INSTALL RDS FLASH BEACON ASSEMBLY	EA	2.00	2.00
0686	6029	IN TRF SIG PL AM (S) 1 ARM (28')	EA	2.00	2.00
0686	6037	IN TRF SIG PL AM (S) 1 ARM (36')	EA	2.00	2.00
0686	6049	IN TRF SIG PL AM (S) 1 ARM (48')	EA	1.00	1.00
0687	6001	PEDESTAL POLE ASSEMBLY	EA	2.00	2.00
6001	6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	34.00	34.00
6056	6001	PREFORMED IN-LANE (TRANS) RUMBLE STRIP	LF	160.00	160.00
6058	6001	BBU SYSTEM (EXTERNAL BATT CABINET)	EA	1.00	1.00
6089	6002	CAT 5 ETHERNET CABLE	LF	1248.00	1248.00
6185	6002	TMA (STATIONARY)	DAY	45.00	45.00
6306	6010	VIVDS CAMERA ASSEMBLY (INSTALL ONLY)	EA	5.00	5.00
*		VIVDS CAMERA ASSEMBLY	EA	5.00	5.00
*		TRAF SIG CONT ASM (TS2)(TY 1) SIZE 6	EA	1.00	1.00
*		GPS ANTENNA	EA	1.00	1.00
**		RAILROAD FORCE ACCOUNT	LS	1.00	1.00
*		PROVIDED BY TXDOT; INSTALLED BY CONTRACTOR. SUBSIDIARY TO ITEM 680 INSTL OF HWY TRAF SIG.			
**		THESE QUANTITIES FOR CONTRACTORS INFORMATION ONLY AND ARE NOT SEPARATE BID ITEMS.			

**PROJECT SUMMARY**



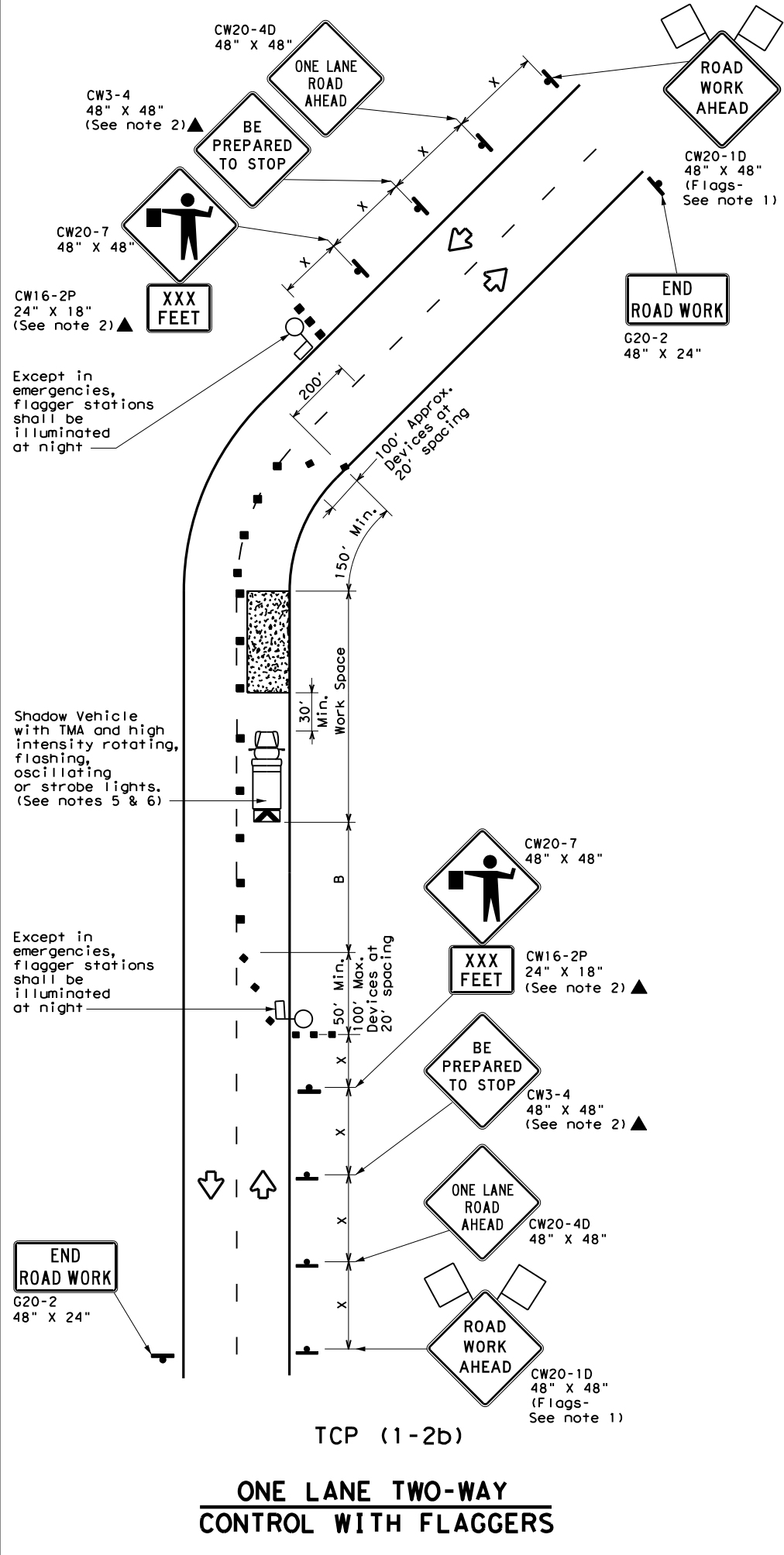
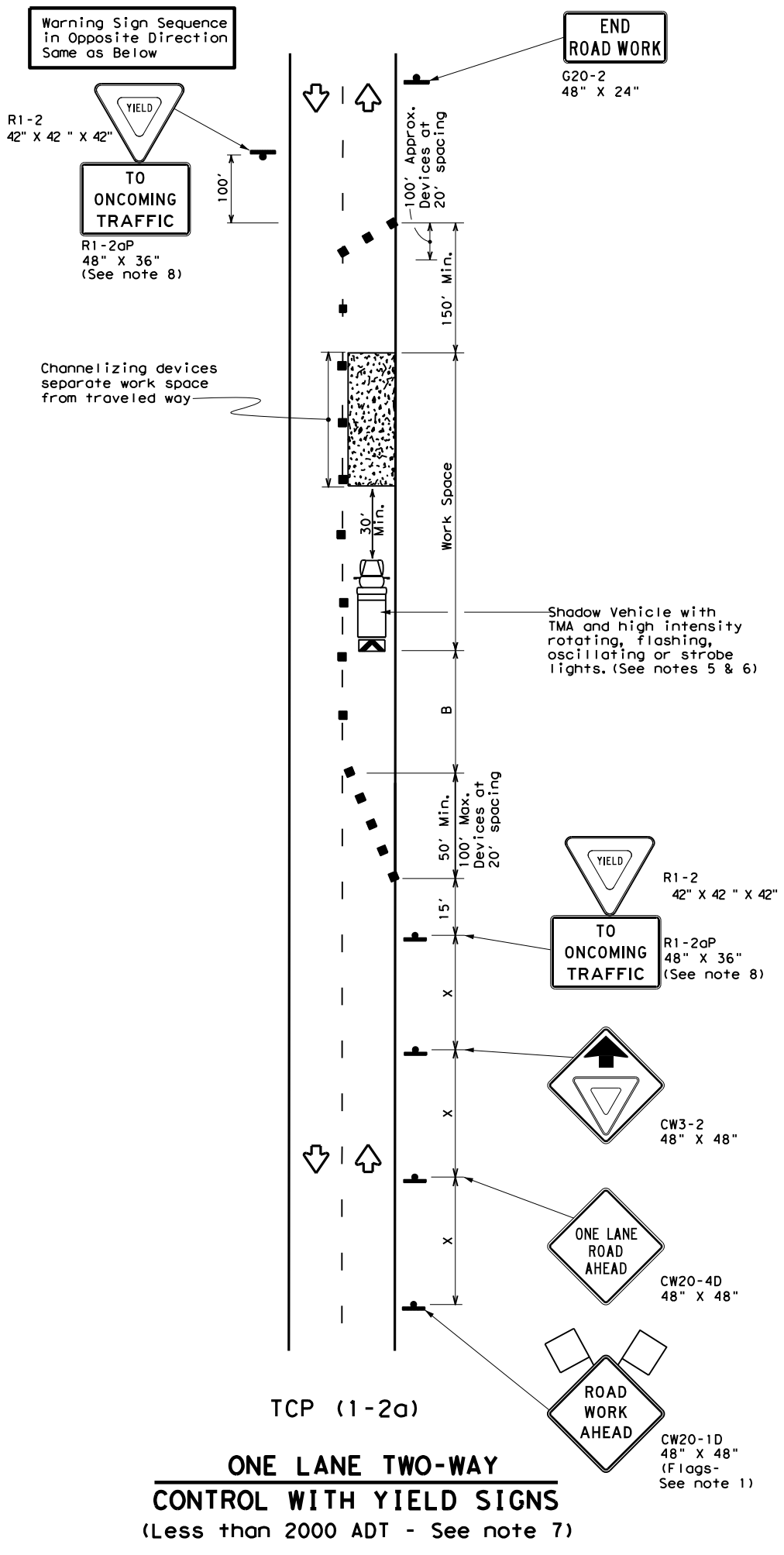
FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				5
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	







DATE: 9/16/2021 1:38:59 PM  
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 DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units or the use of this standard in any project. TxDOT is not responsible for any errors or omissions in this standard or for any damages resulting from its use.



LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

**GENERAL NOTES**

- Flags attached to signs where shown are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
- The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4D "ONE LANE ROAD AHEAD" sign, but proper sign spacing shall be maintained.
- Sign spacing may be increased or an additional CW20-1D "ROAD WORK AHEAD" sign may be used if advance warning ahead of the flagger or R1-2 "YIELD" sign is less than 1500 feet.
- A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.

**TCP (1-2a)**

- R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work spaces should be no longer than one half city block. In rural areas on roadways with less than 2000 ADT, work spaces should be no longer than 400 feet.
- R1-2 "YIELD" sign with R1-2aP "TO ONCOMING TRAFFIC" plaque shall be placed on a support at a 7 foot minimum mounting height.

**TCP (1-2b)**

- Flaggers should use two-way radios or other methods of communication to control traffic.
- Length of work space should be based on the ability of flaggers to communicate.
- If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain adequate stopping sight distance to the flagger and a queue of stopped vehicles (see table above).
- Channelizing devices on the center-line may be omitted when a pilot car is leading traffic and approved by the Engineer.
- Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

Traffic Operations Division Standard

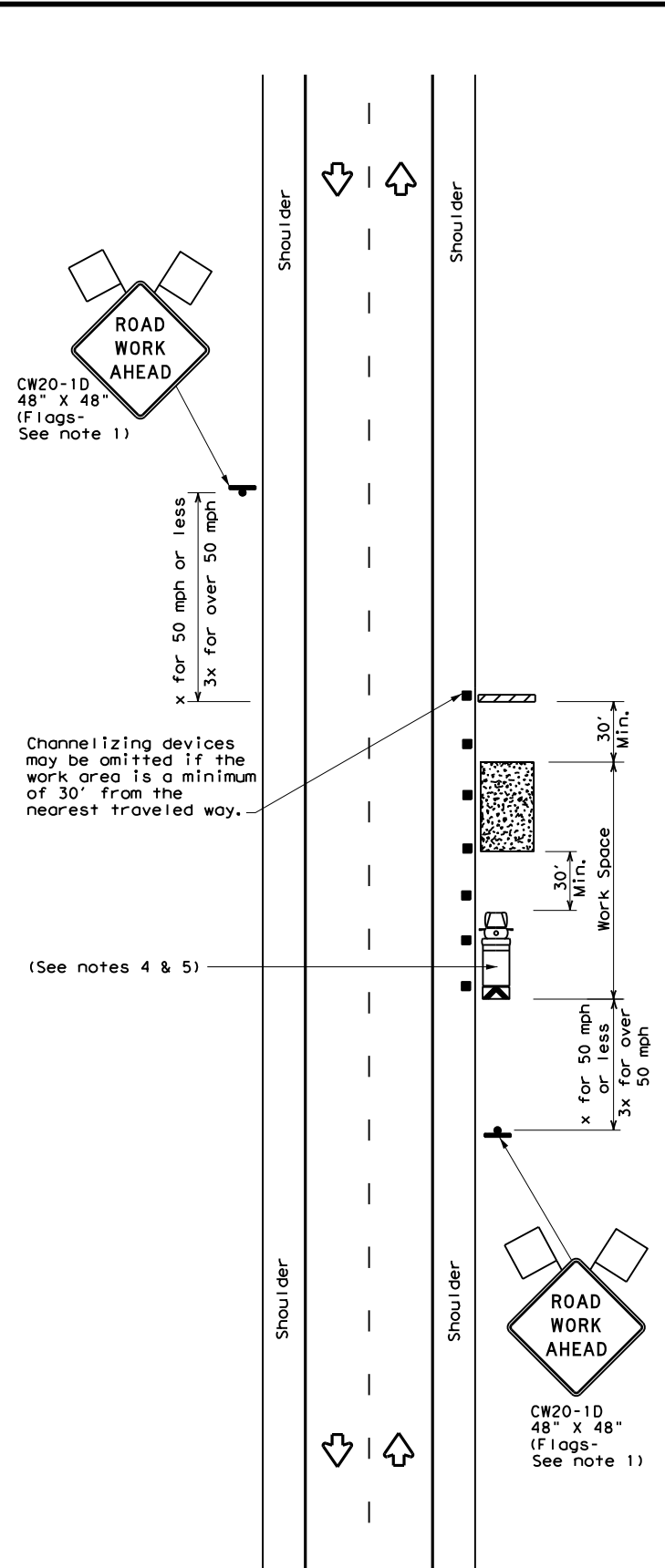
**TRAFFIC CONTROL PLAN**  
**ONE-LANE TWO-WAY**  
**TRAFFIC CONTROL**

**TCP (1-2) - 18**

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© TxDOT December 1985	CON:	SECT:	JOB:	HIGHWAY:
REVISIONS	0046	06	082	US 82
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2-94 2-12	ATL	BOWIE	8	
1-97 2-18				

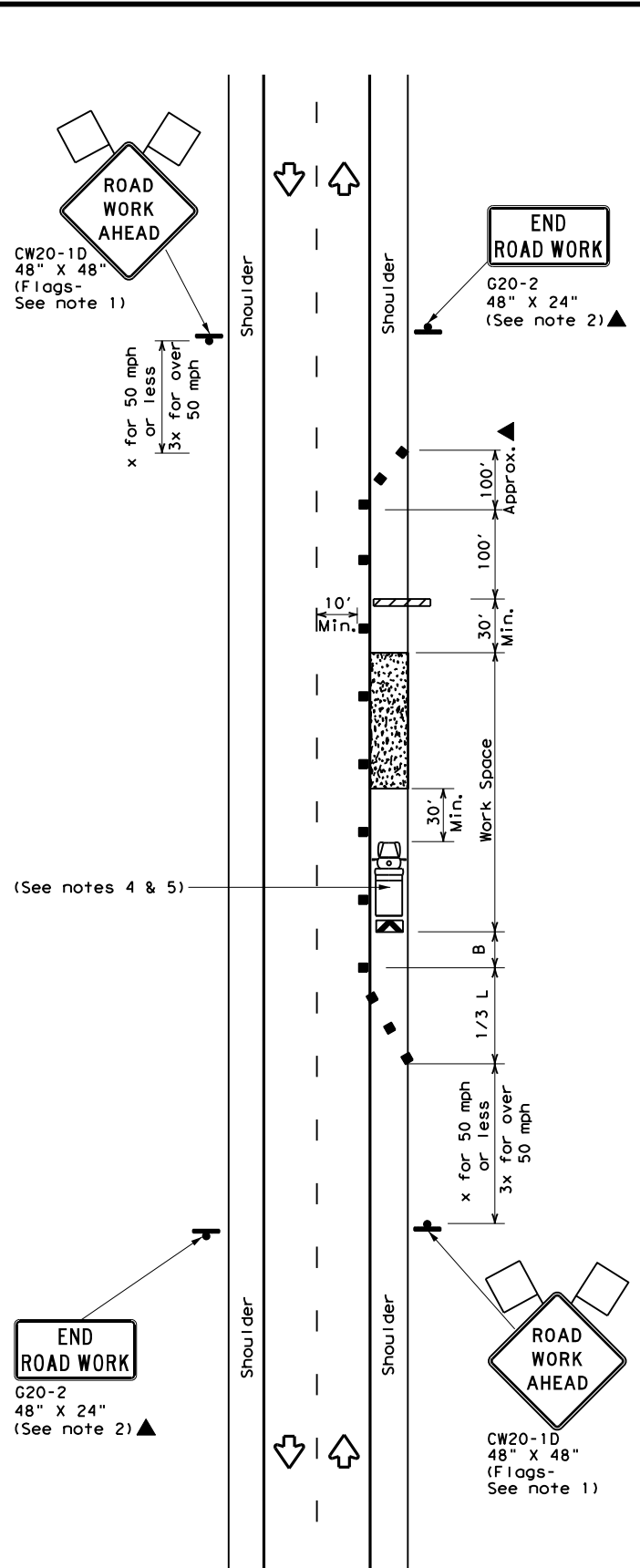
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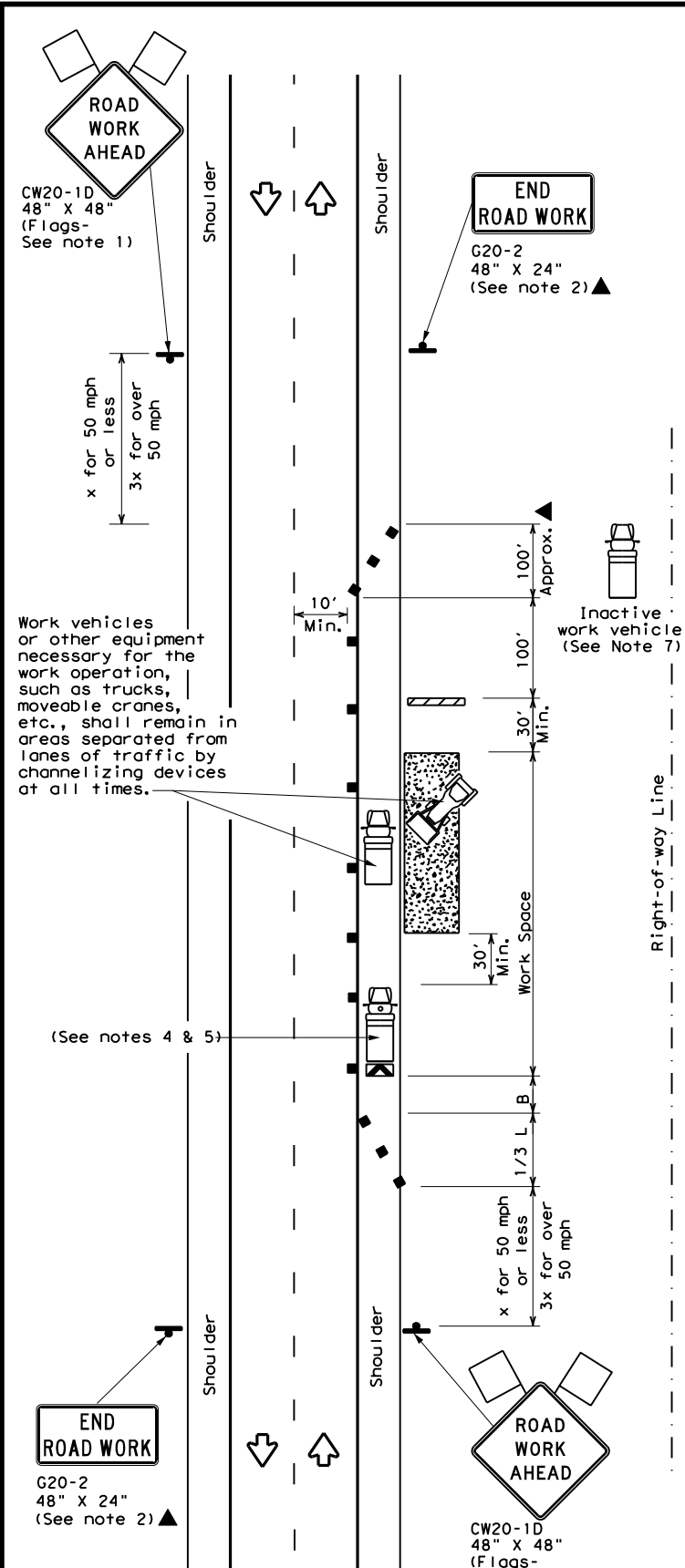
TCP (2-1a)

**WORK SPACE NEAR SHOULDER**  
 Conventional Roads



TCP (2-1b)

**WORK SPACE ON SHOULDER**  
 Conventional Roads



TCP (2-1c)

**WORK VEHICLES ON SHOULDER**  
 Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	✓

**GENERAL NOTES**

- Flags attached to signs where shown, are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
- Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
- Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
- Additional work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
- CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

Texas Department of Transportation  
 Traffic Operations Division Standard

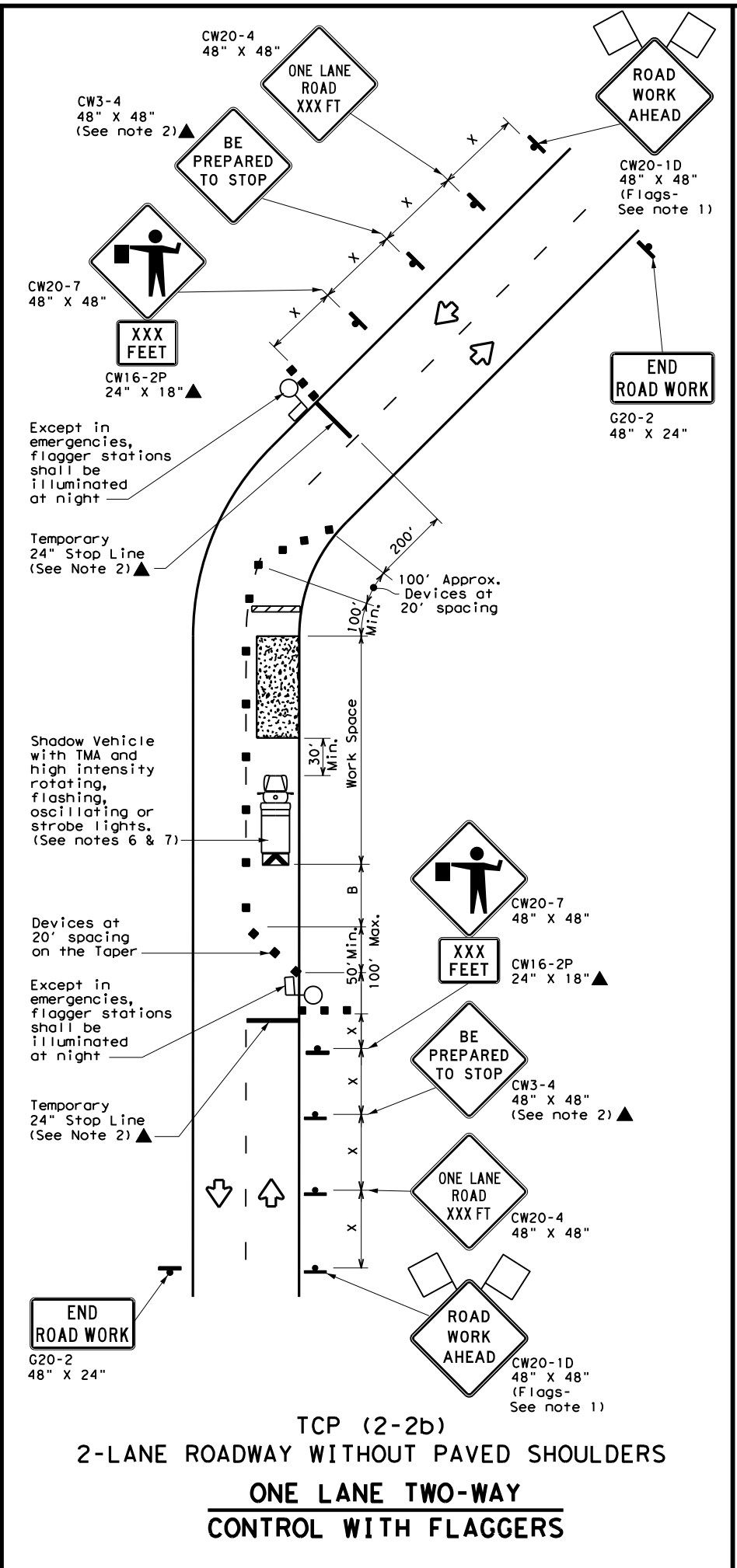
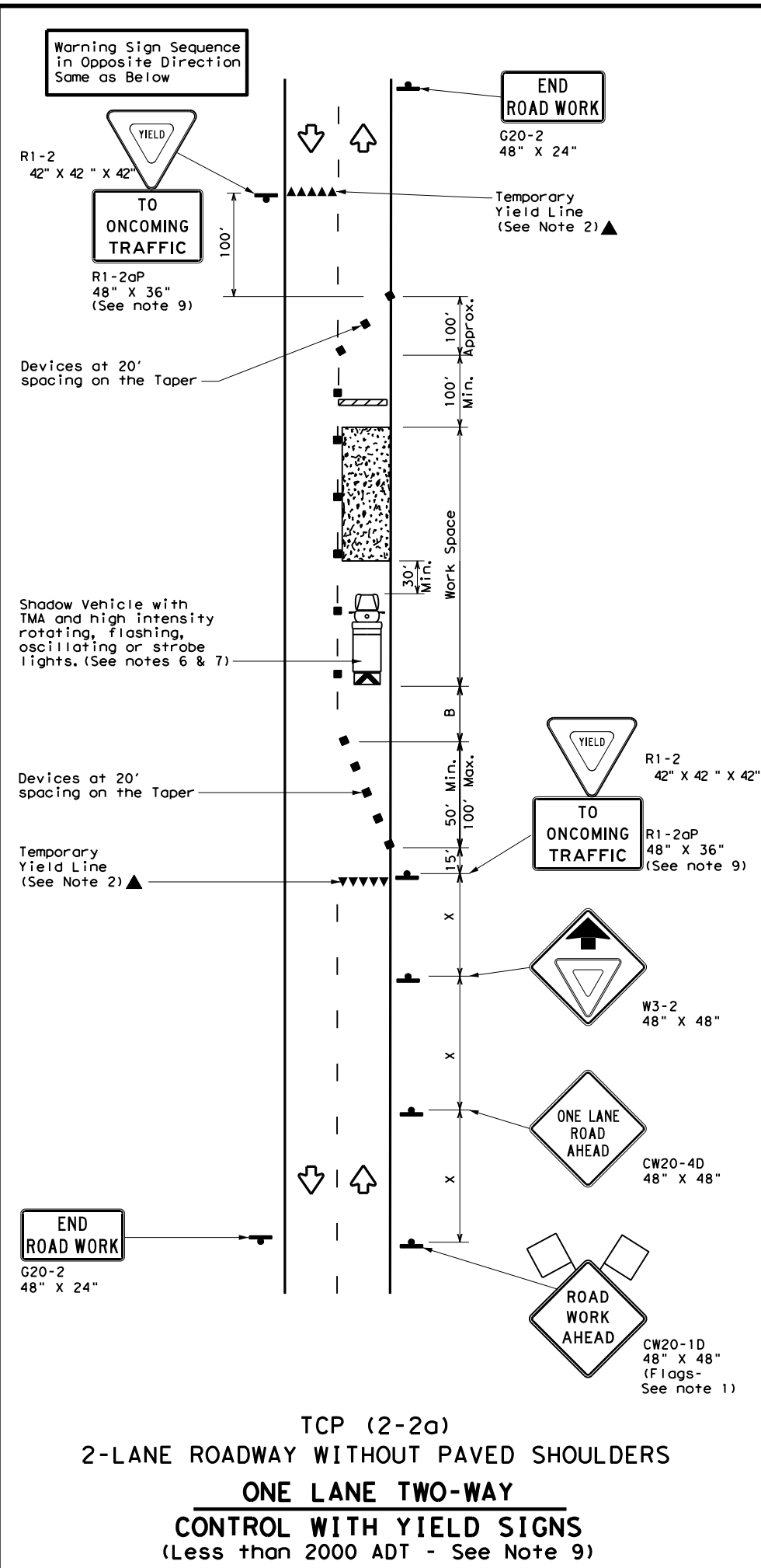
**TRAFFIC CONTROL PLAN**  
**CONVENTIONAL ROAD**  
**SHOULDER WORK**

**TCP (2-1) - 18**

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© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
2-94 4-98	DIST	COUNTY	SHEET NO.	
8-95 2-12	ATL	BOWIE	9	
1-97 2-18				

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LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'	200'
35		205'	225'	245'	35'	70'	160'	120'	250'
40		265'	295'	320'	40'	80'	240'	155'	305'
45	L = WS	450'	495'	540'	45'	90'	320'	195'	360'
50		500'	550'	600'	50'	100'	400'	240'	425'
55		550'	605'	660'	55'	110'	500'	295'	495'
60		600'	660'	720'	60'	120'	600'	350'	570'
65		650'	715'	780'	65'	130'	700'	410'	645'
70		700'	770'	840'	70'	140'	800'	475'	730'
75		750'	825'	900'	75'	150'	900'	540'	820'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓	✓	

**GENERAL NOTES**

- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - The CW3-4 "BE PREPARED TO STOP" sign may be installed after the CW20-4 "ONE LANE ROAD XXX FT" sign, but proper sign spacing shall be maintained.
  - Flaggers should use two-way radios or other methods of communication to control traffic.
  - Length of work space should be based on the ability of flaggers to communicate.
  - A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-2a)**
- The R1-2 "YIELD" sign traffic control may be used on projects with approaches that have adequate sight distance. For projects in urban areas, work space should be no longer than one half city block. In rural areas, roadways with less than 2000 ADT, work space should be no longer than 400 feet.
  - The R1-2aP "YIELD TO ONCOMING TRAFFIC" sign shall be placed on a support at a 7 foot minimum mounting height.
- TCP (2-2b)**
- Channelizing devices on the center line may be omitted when a pilot car is leading traffic and approved by the Engineer.
  - If the work space is located near a horizontal or vertical curve, the buffer distances should be increased in order to maintain stopping sight distance to the flagger and a queue of stopped vehicles. (See table above).
  - Flaggers should use 24" STOP/SLOW paddles to control traffic. Flags should be limited to emergency situations.

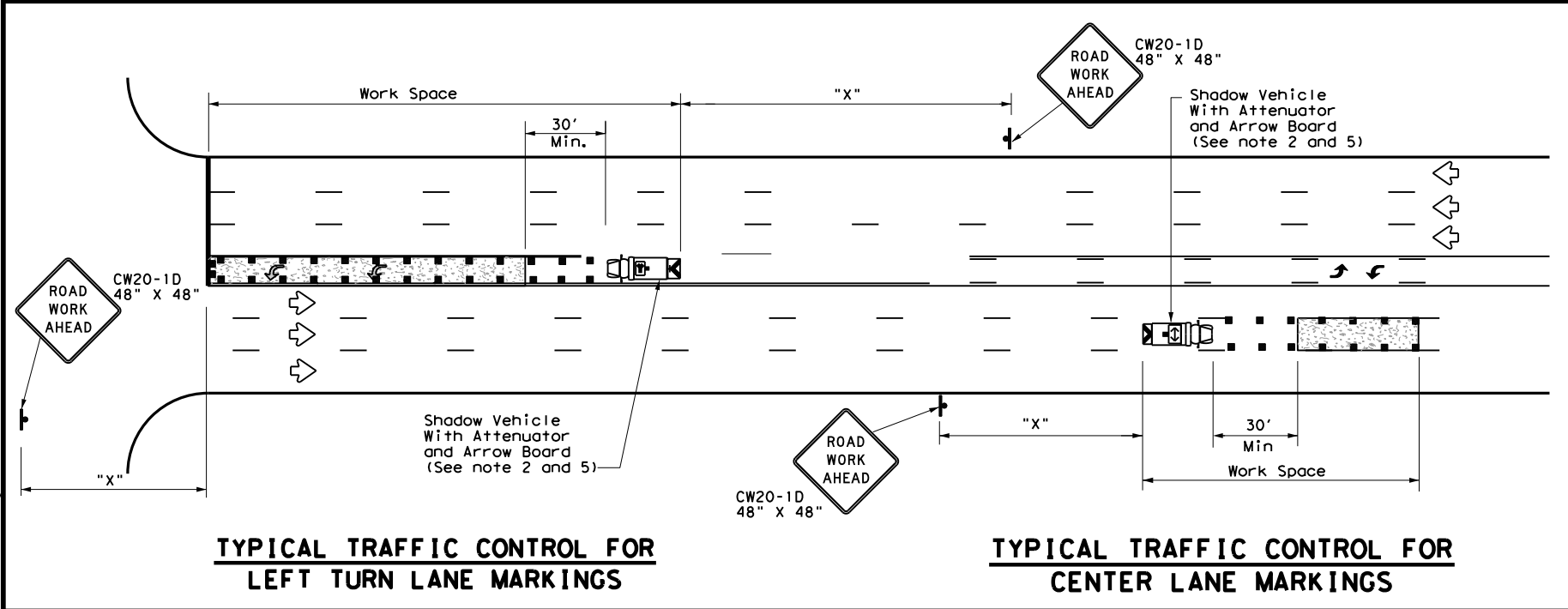
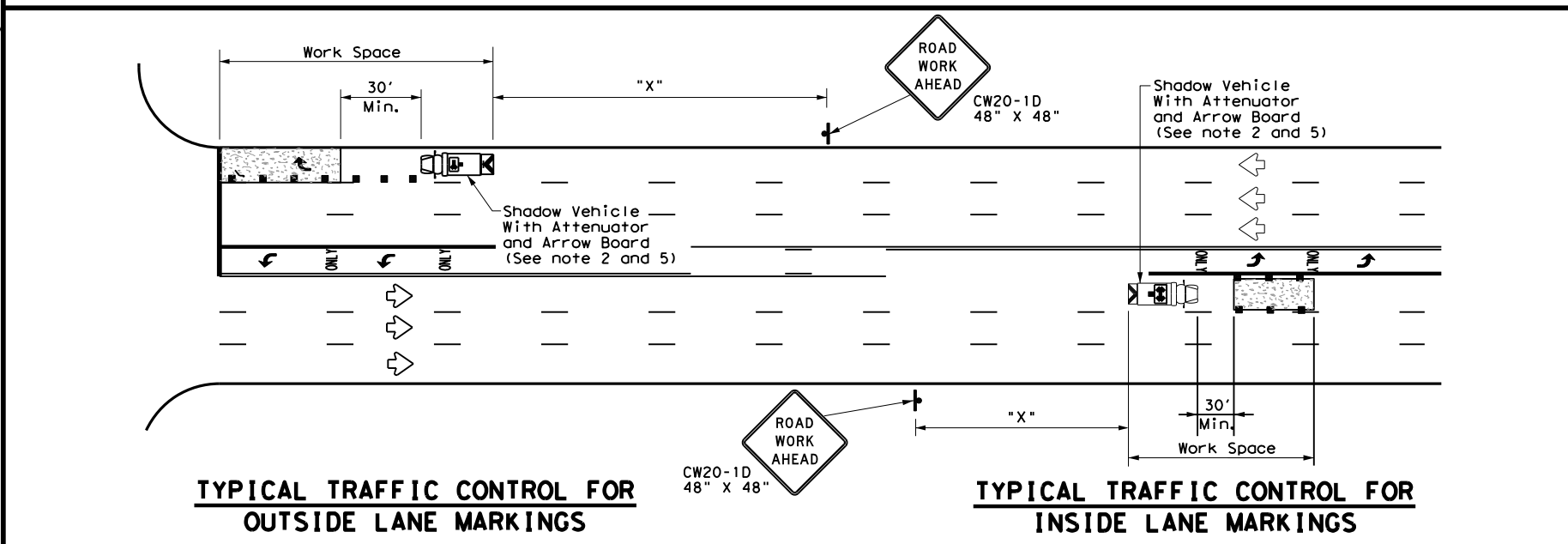
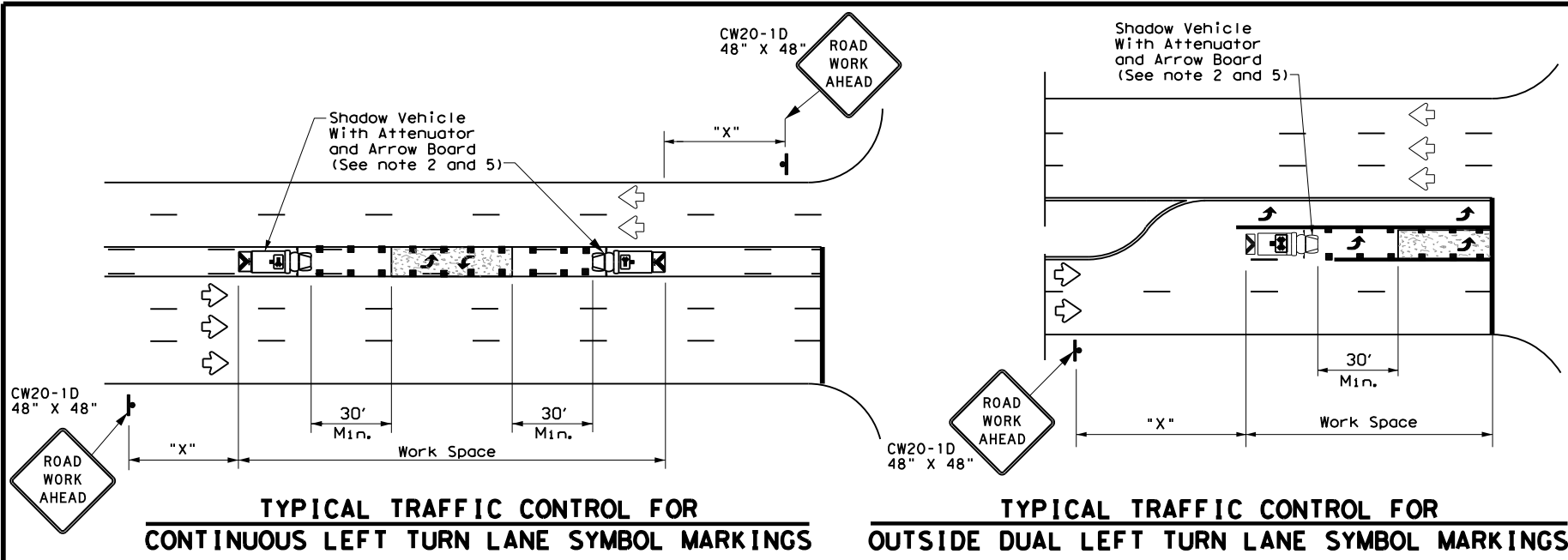
Traffic Operations Division Standard

**TRAFFIC CONTROL PLAN  
ONE-LANE TWO-WAY  
TRAFFIC CONTROL**

**TCP (2-2) - 18**

FILE:	tcp2-2-18.dgn	DN:		CK:		DW:		CK:	
© TxDOT	December 1985	CON:		SECT:		JOB:		HIGHWAY:	
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8-95	3-03	DIST:		COUNTY:		SHEET NO.:			
1-97	2-12	ATL	BOWIE			10			
4-98	2-18								

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LEGEND			
*	Trail Vehicle	ARROW BOARD DISPLAY	
**	Shadow Vehicle		
** *	Work Vehicle		RIGHT Directional
	Heavy Work Vehicle		LEFT Directional
	Truck Mounted Attenuator (TMA)		Double Arrow
	Traffic Flow		Channelizing Devices

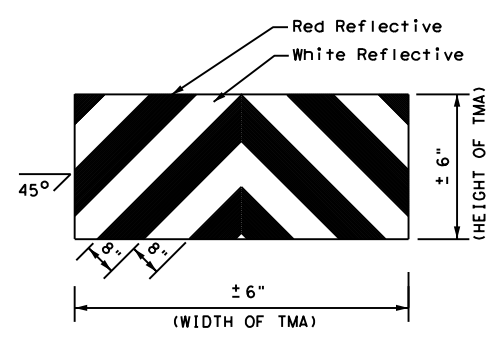
Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS/60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
✓				

**GENERAL NOTES**

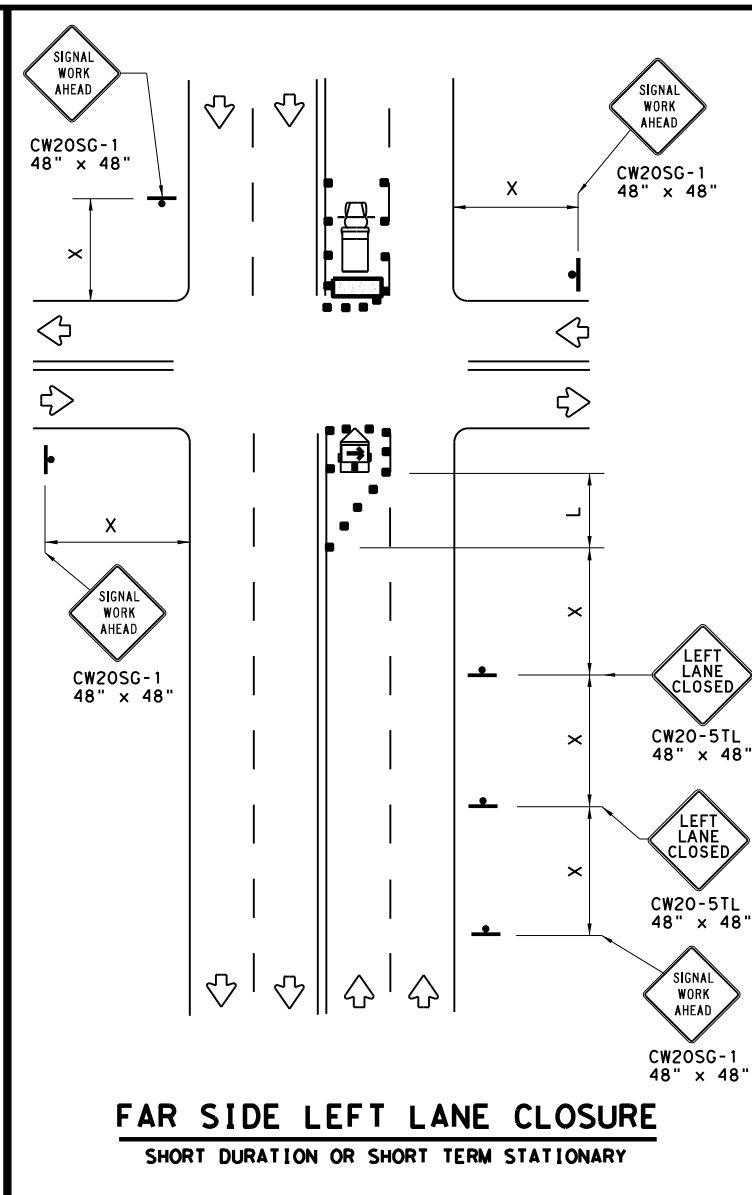
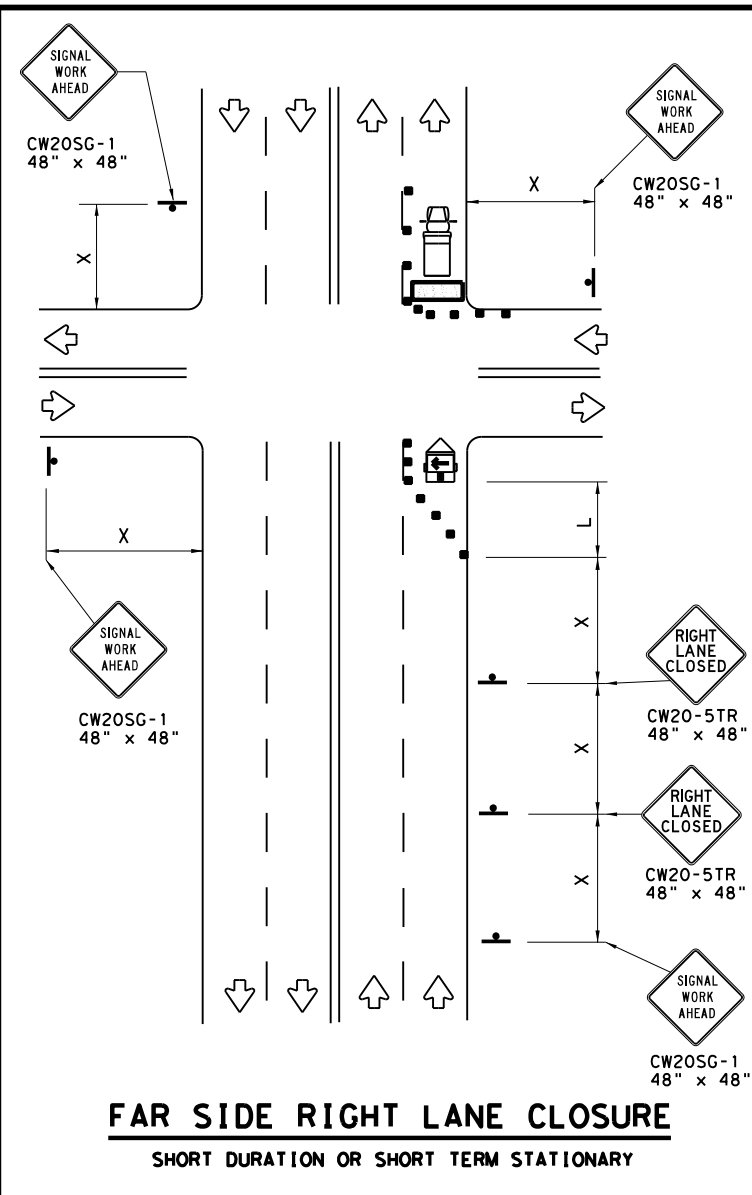
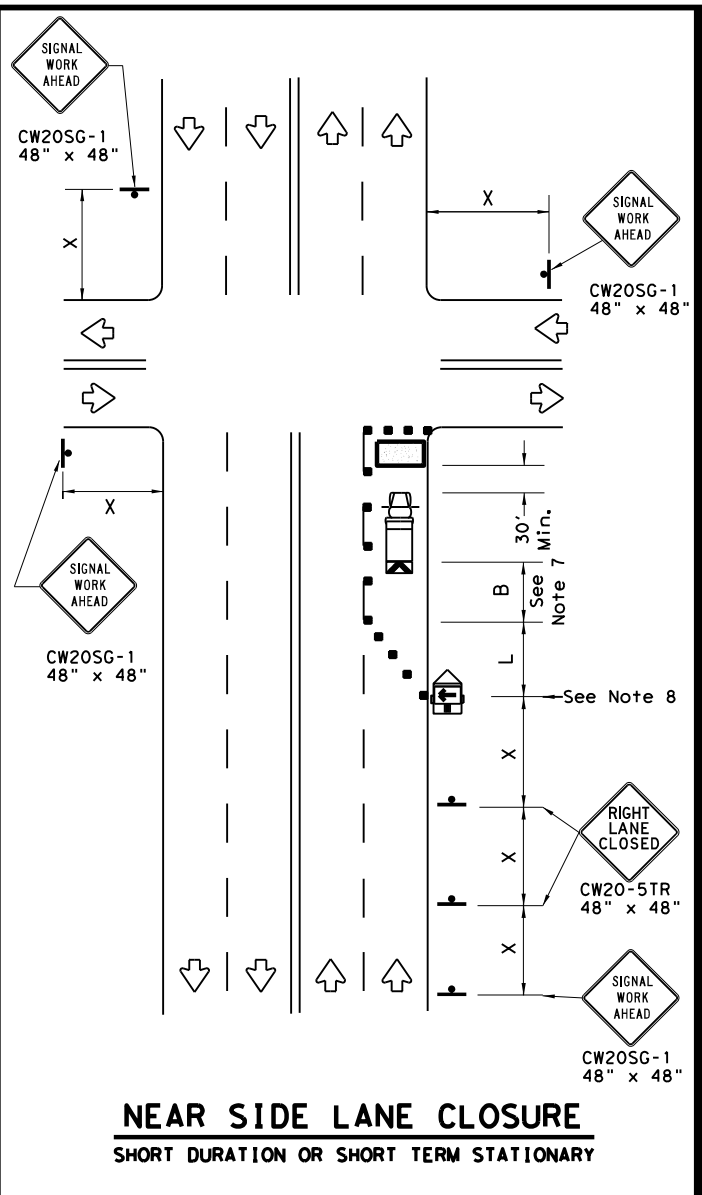
1. This traffic control plan is for use on conventional roads posted at 45 mph or less and is intended for mobile operations that move continuously or intermittently (stopping up to approximately 15 minutes) such as short-line striping and in-lane rumble strips. When activities are anticipated to take longer amounts of time or traffic conditions warrant, a short duration or short-term stationary traffic control plan should be used.
2. A Truck Mounted Attenuator shall be used on Shadow Vehicle. Striping on the back panel of all truck mounted attenuators shall be 8" red and white reflective sheeting placed in an inverted "V" design. Reflective sheeting shall meet or exceed the reflectivity and color requirements of departmental material specification DMS-8300, Type A.
3. All traffic control devices shall be in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD), latest edition.
4. The use of yellow rotating beacons or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the drivers side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.
5. Flashing arrow board shall be used on Shadow Vehicle. Flashing arrow board shall be Type B or Type C as per BC Standards. The arrow board operation shall be controlled from inside the truck.



		<b>Traffic Operations Division Standard</b>	
<b>TRAFFIC CONTROL PLAN          MOBILE OPERATIONS FOR          ISOLATED WORK AREAS          UNDIVIDED HIGHWAYS</b>			
<b>TCP(3-4)-13</b>			
FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT July, 2013	CONT SECT	JOB	HIGHWAY
REVISIONS	0046 06	082	US 82
	DIST	COUNTY	SHEET NO.
	ATL	BOWIE	11

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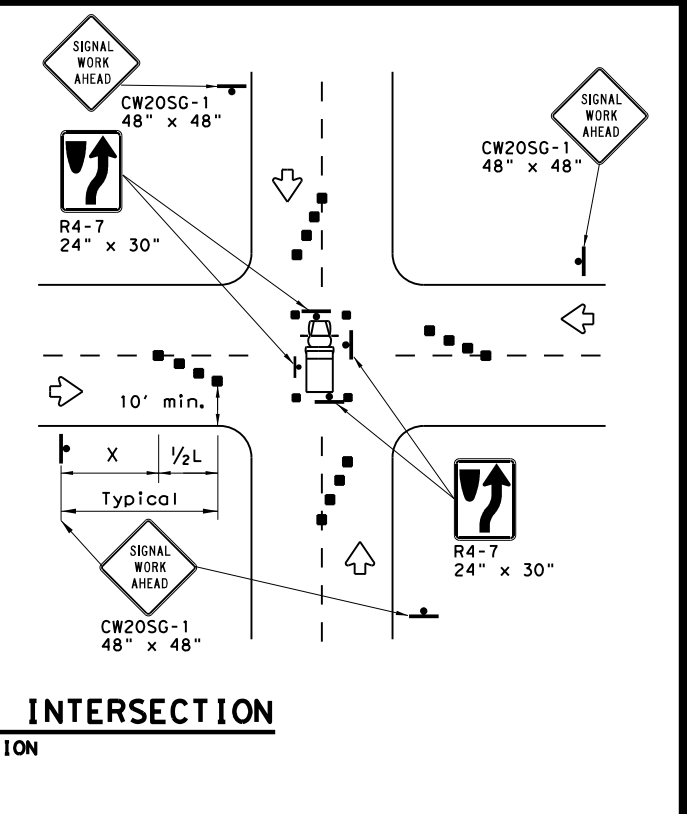
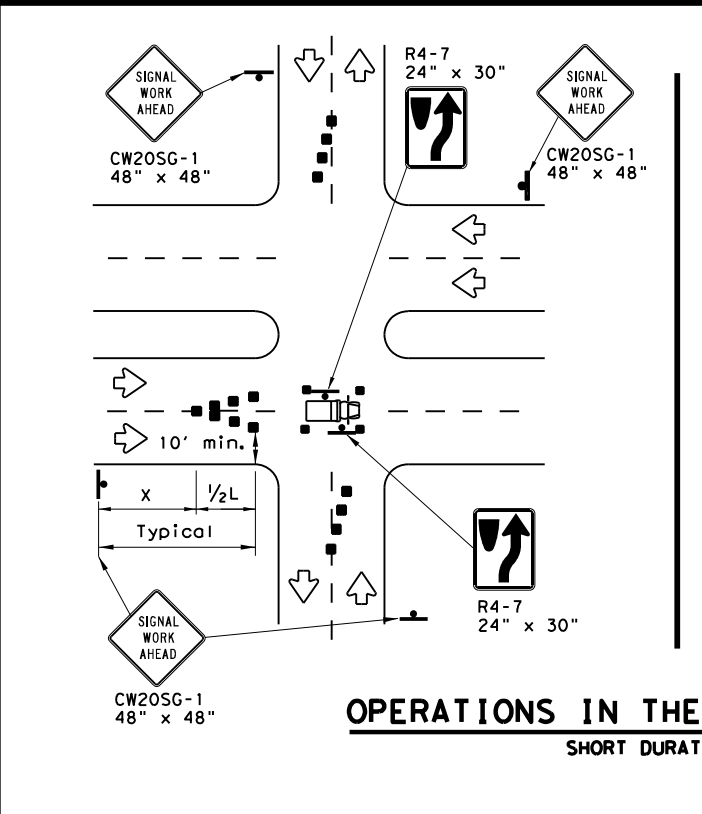


LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45	L = WS	450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75	750'	825'	900'	75'	150'	900'	540'	

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

**WORKERS IN BUCKET TRUCKS SHALL NOT WORK ABOVE OPEN LANES OF TRAFFIC.**



**GENERAL NOTES**

- The minimum size channelizing device is the 28" cone. 42" Two-piece cones, drums, vertical panels or barricades will be required when the device must be left unattended at night.
- Obstructions or hazards at the work area shall be clearly marked and delineated at all times.
- Flaggers and Flagger Symbol (CW20-7) signs may be required according to field conditions.
- Vehicles parked in roadway shall be equipped with at least two high intensity rotating, flashing, oscillating or strobe type lights.
- High level warning devices (flag trees) may be used at corners of the vehicle.
- When work operations are performed on existing signals, the signals may be placed in flashing red mode when approved by the engineer. If existing signals do not have power, All-Way Stop (R1-1 and R1-3P) signs may be implemented when approved by the engineer.
- For Short-Term Stationary work the buffer space "B" from the above table should be used if field conditions permit. For Short Duration (less than 1 hour) any buffer space provided will enhance the safety of the setup.
- The arrow board at this location may be omitted for Short Duration work if the work vehicle has an arrow board in operation. As an option, the arrow board may be placed at the end of the taper in the closed lane if space is not available at the beginning of the taper.
- Signs and devices for the NEAR SIDE LANE CLOSURE may be altered for a left lane closure by using a LEFT LANE CLOSED (CW20-5TL) and adding channelizing devices on the centerline to protect the work space from opposing traffic.



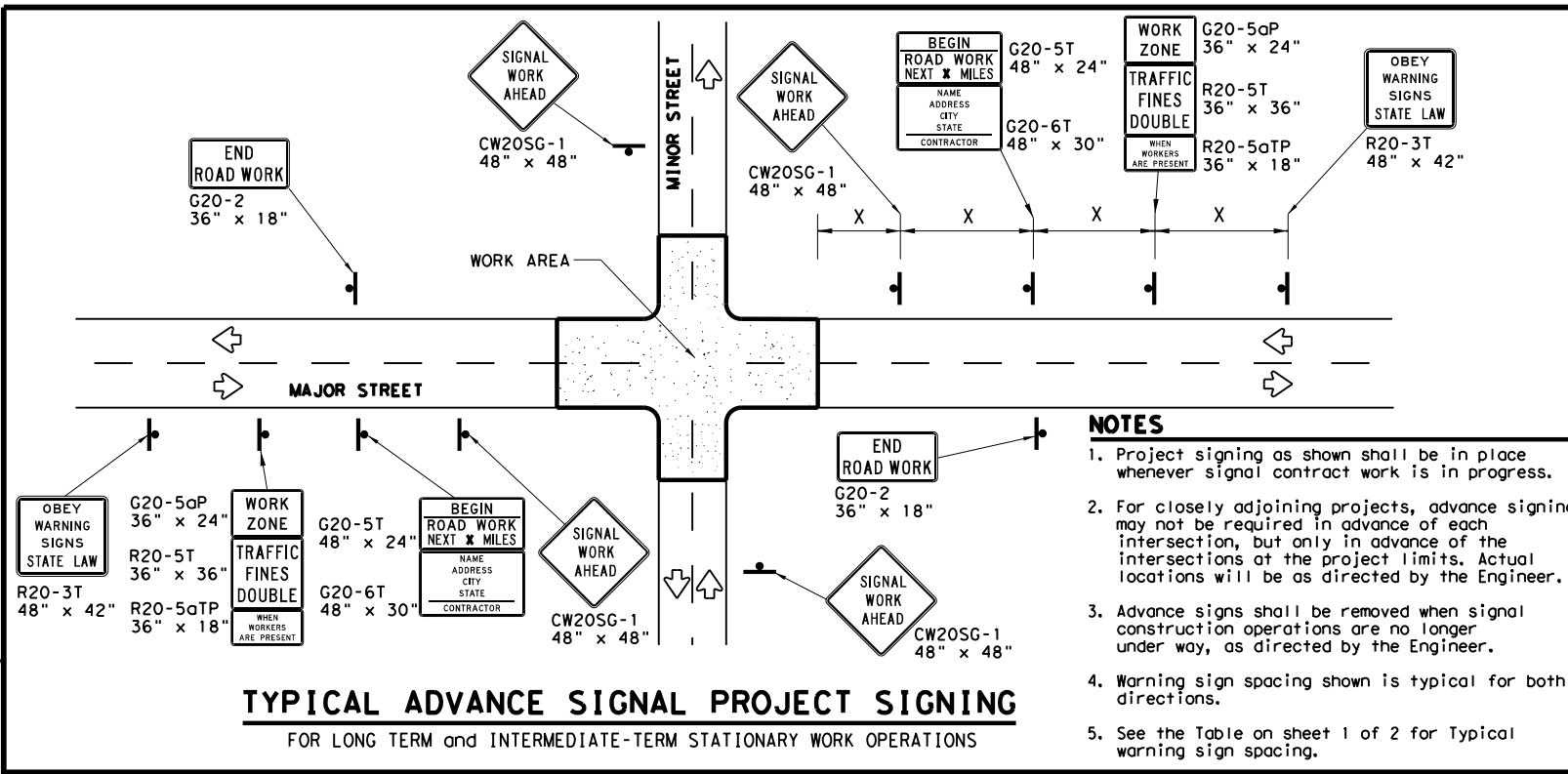
**TRAFFIC SIGNAL WORK TYPICAL DETAILS**

**WZ(BTS-1)-13**

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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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2-98 10-99 7-13	DIST	COUNTY	SHEET NO.	
4-98 3-03	ATL	BOWIE	12	

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- NOTES**
1. Project signing as shown shall be in place whenever signal contract work is in progress.
  2. For closely adjoining projects, advance signing may not be required in advance of each intersection, but only in advance of the intersections at the project limits. Actual locations will be as directed by the Engineer.
  3. Advance signs shall be removed when signal construction operations are no longer under way, as directed by the Engineer.
  4. Warning sign spacing shown is typical for both directions.
  5. See the Table on sheet 1 of 2 for Typical warning sign spacing.

**GENERAL NOTES FOR WORK ZONE SIGNS**

1. Signs shall be installed and maintained in a straight and plumb condition.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. Nails shall NOT be used to attach signs to any support.
5. All signs shall be installed in accordance with the plans or as directed by the Engineer.
6. The Contractor shall furnish the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD).
7. The Contractor shall furnish sign supports and substrates listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD), installed as per the manufacturer's recommendations.
8. Temporary signs that have damaged or cracked substrates and/or damaged or marred reflective sheeting shall be replaced as directed by the Engineer.
9. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1".
10. Damaged wood posts shall be replaced. Splicing wood posts will not be allowed.

**DURATION OF WORK**

1. Work zone durations are defined in Part 6, Section 60.02 of the Texas Manual on Uniform Traffic Control Devices (TMUTCD).

**SIGN MOUNTING HEIGHT**

1. Sign height of Long-term/Intermediate-term warning signs shall be as shown on Figure 6F-1 of the TMUTCD.
2. Sign height of Short-term/Short Duration warning signs shall be as shown on Figure 6F-2 of the TMUTCD.
3. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

**REMOVING OR COVERING**

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered, unless otherwise approved by the Engineer.
2. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night without damaging the sign sheeting. Burlap, or heavy materials such as plywood or aluminum shall not be used to cover signs.
3. Duct tape or other adhesive material shall NOT be affixed to a sign face.
4. Signs and anchor stubs shall be removed and holes back filled upon completion of the work.

**REFLECTIVE SHEETING**

1. All signs shall be retroreflective and constructed of sheeting meeting the requirements of the DMS and color usage table shown on this sheet.

**SIGN SUPPORT WEIGHTS**

1. Weights used to keep signs from turning over should be sandbags filled with dry, cohesionless material.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects will not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber, such as fire inner tubes, shall not be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

**LEGEND**

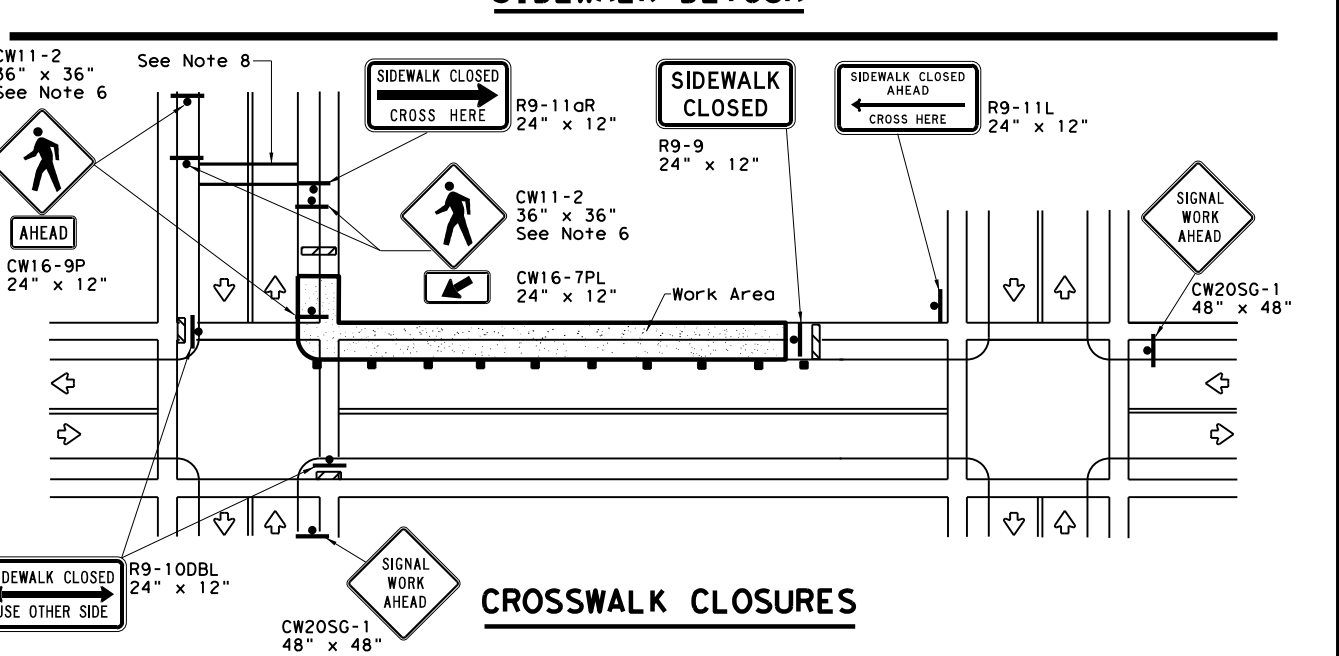
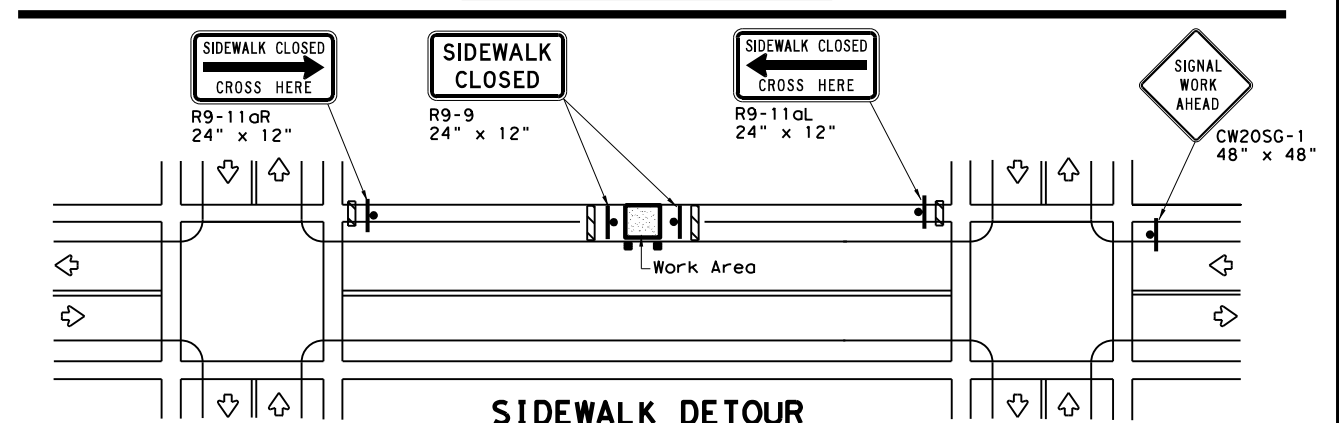
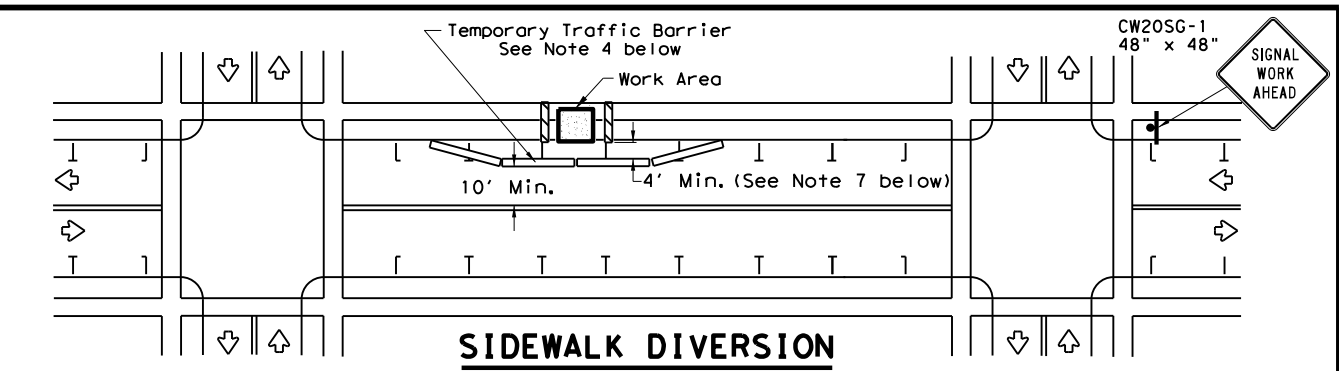
	Sign
	Channelizing Devices
	Type 3 Barricade

**DEPARTMENTAL MATERIAL SPECIFICATIONS**

SIGN FACE MATERIALS	DMS-8300
FLEXIBLE ROLL-UP REFLECTIVE SIGNS	DMS-8310

COLOR	USAGE	SHEETING MATERIAL
ORANGE	BACKGROUND	TYPE B <sub>FL</sub> OR TYPE C <sub>FL</sub> SHEETING
WHITE	BACKGROUND	TYPE A SHEETING
BLACK	LEGEND & BORDERS	ACRYLIC NON-REFLECTIVE SHEETING

Only pre-qualified products shall be used. A copy of the "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found at the following web address:  
[http://www.txdot.gov/txdot\\_library/publications/construction.htm](http://www.txdot.gov/txdot_library/publications/construction.htm)



**PEDESTRIAN CONTROL**

1. Holes, trenches or other hazards shall be adequately protected by covering, delineating or surrounding the hazard with orange plastic pedestrian fencing or longitudinal channelizing devices, or as directed by the Engineer.
2. "CROSSWALK CLOSURES" as detailed above will require the Engineer's approval prior to installation.
3. R9 series signs shown may be placed on supports detailed on the BC standards or CWZTCD list, or when fabricated from approved lightweight plastic substrates, they may be mounted on top of a plastic drum at or near the location shown.
4. For speeds less than 45 mph longitudinal channelizing devices may be used instead of traffic barriers when approved by the Engineer. Attenuation of blunt ends and installation of water filled devices shall be as per BC(9) and manufacturer's recommendations.
5. Location of devices are for general guidance. Actual device spacing and location must be field adjusted to meet actual conditions.
6. Where pedestrians with visual disabilities normally use the closed sidewalk Detectable Pedestrian Barricades should be used instead of the Type 3 Barricades shown.
7. The width of existing sidewalk should be maintained if practical.
8. Pavement markings for mid-block crosswalks shall be paid for under the appropriate bid items.
9. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

SHEET 2 OF 2

Traffic Operations Division Standard

**TRAFFIC SIGNAL WORK BARRICADES AND SIGNS**

**WZ(BTS-2)-13**

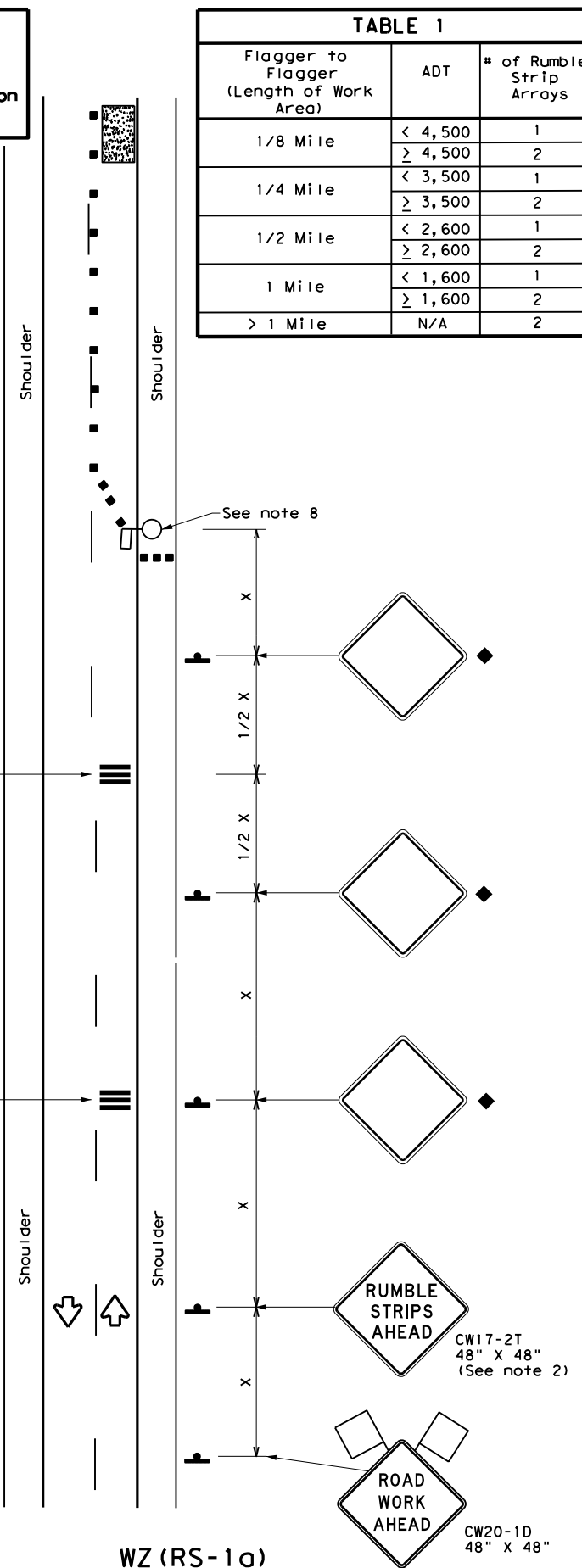
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© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
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4-98 3-03	ATL	BOWIE	13	



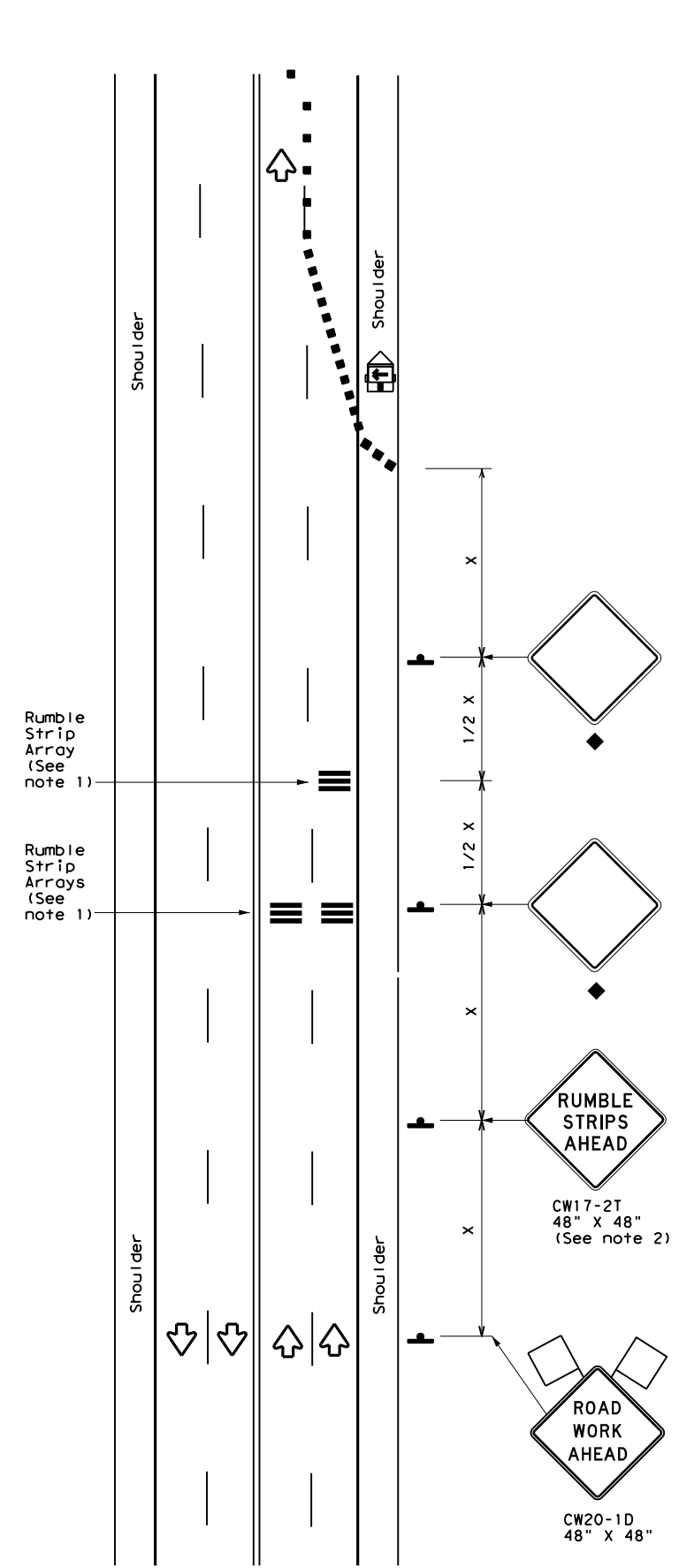
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Warning sign and rumble strip sequence in opposite direction is same as below

Flagger to Flagger (Length of Work Area)	ADT	# of Rumble Strip Arrays
1/8 Mile	< 4,500	1
	≥ 4,500	2
1/4 Mile	< 3,500	1
	≥ 3,500	2
1/2 Mile	< 2,600	1
	≥ 2,600	2
1 Mile	< 1,600	1
	≥ 1,600	2
> 1 Mile	N/A	2



WZ (RS-1a)  
75 mph or Less  
**RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION**



WZ (RS-1b)  
75 mph or Less  
**RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY**

**GENERAL NOTES**

- Each Rumble Strip Array should consist of three rumble strips spaced center to center at the spacing shown in Table 2, placed transverse across the lane at locations shown.
- The CW17-2T "RUMBLE STRIPS AHEAD" sign should be located after the CW20-1D "ROAD WORK AHEAD" sign and spaced as shown. If traffic is observed to be queuing, or is expected to queue beyond the Rumble Strips, the CW17-2T sign and the first Rumble Strip Array may be located upstream of the CW20-1D sign as necessary to provide needed warning.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Removal of the Temporary Rumble Strips should be accomplished before removing the advance warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an AFAD or a portable traffic signal.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment.

Speed	Approximate distance between strips in an Array
≤ 40 MPH	10'
> 40 MPH & ≤ 55 MPH	15'
> 55 MPH	20'

	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Panel		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40	L = WS	265'	295'	320'	40'	80'	240'	155'
45		450'	495'	540'	45'	90'	320'	195'
50	L = WS	500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60	L = WS	600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	L = WS	700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

\* Conventional Roads Only  
 \*\* Taper lengths have been rounded off.  
 L=Length of Taper (FT) W=Width of Offset (FT)  
 S=Posted Speed (MPH)

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

◆ Signs are for illustrative purposes only. Signs required may vary depending on the TCP, TMUTCD Typical Application, or project specific details for the project.

Texas Department of Transportation Traffic Operations Division Standard

## TEMPORARY RUMBLE STRIPS

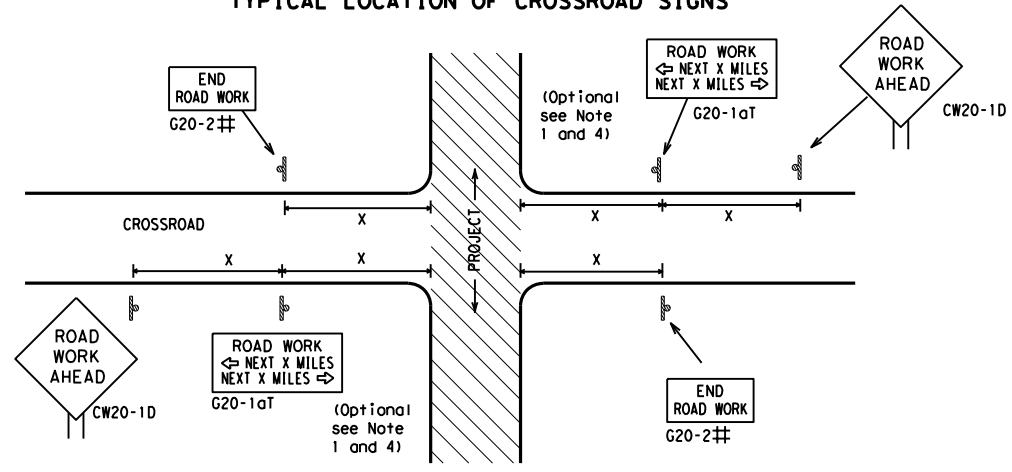
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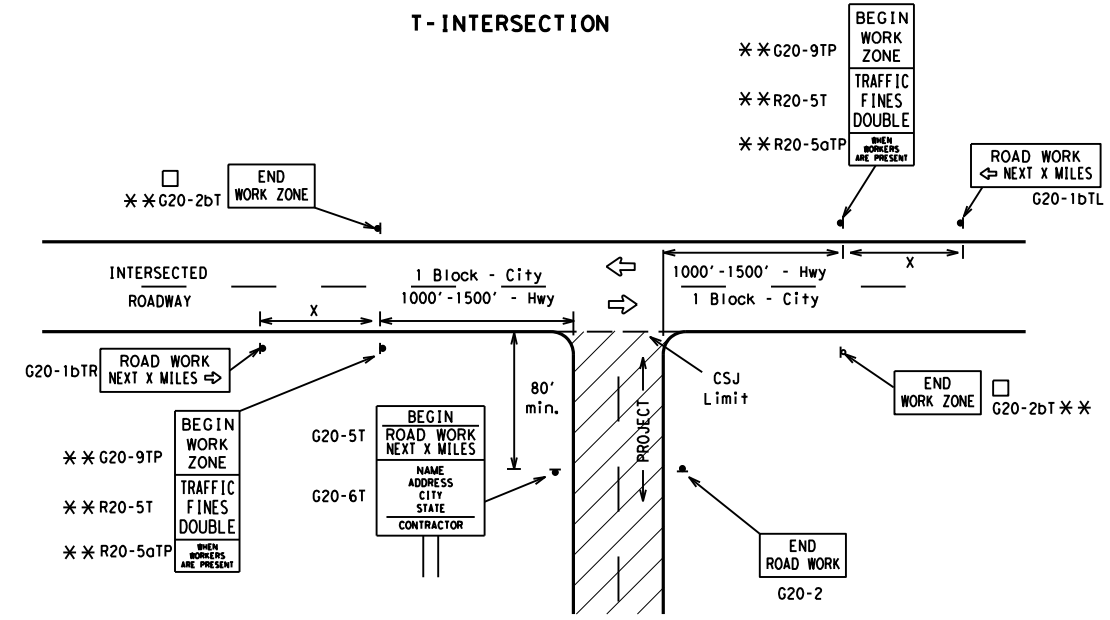
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**TYPICAL LOCATION OF CROSSROAD SIGNS**



- ## May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)
- The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
  - The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume as per TMUTCD Part 5. This information shall be shown in the plans.
  - Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
  - The "ROAD WORK NEXT X MILES" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
  - Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
  - When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

**T-INTERSECTION**



**CSJ LIMITS AT T-INTERSECTION**

- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection, the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

**TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING<sup>1,5,6</sup>**

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "x" Feet (Apprx.)
CW20 <sup>4</sup>	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 <sup>2</sup>
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 <sup>2</sup>
			65	700 <sup>2</sup>
			70	800 <sup>2</sup>
			75	900 <sup>2</sup>
			80	1000 <sup>2</sup>
			*	* <sup>3</sup>

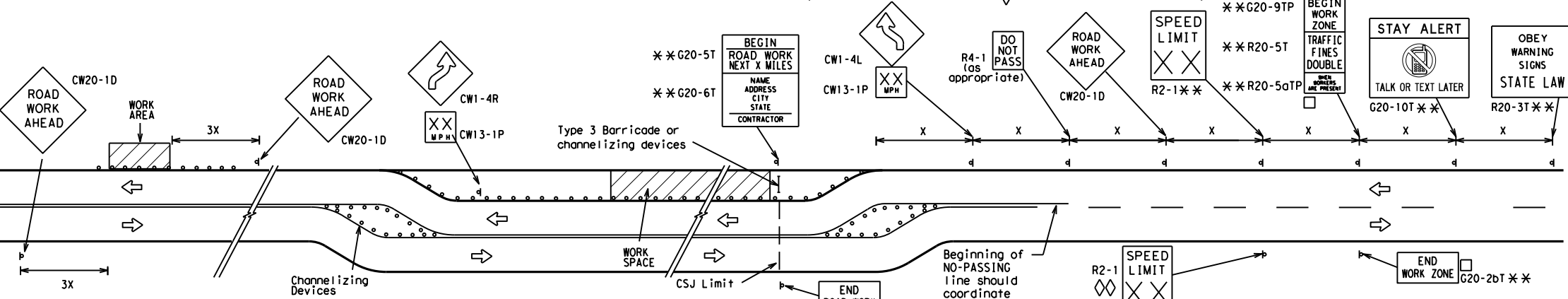
\* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

**GENERAL NOTES**

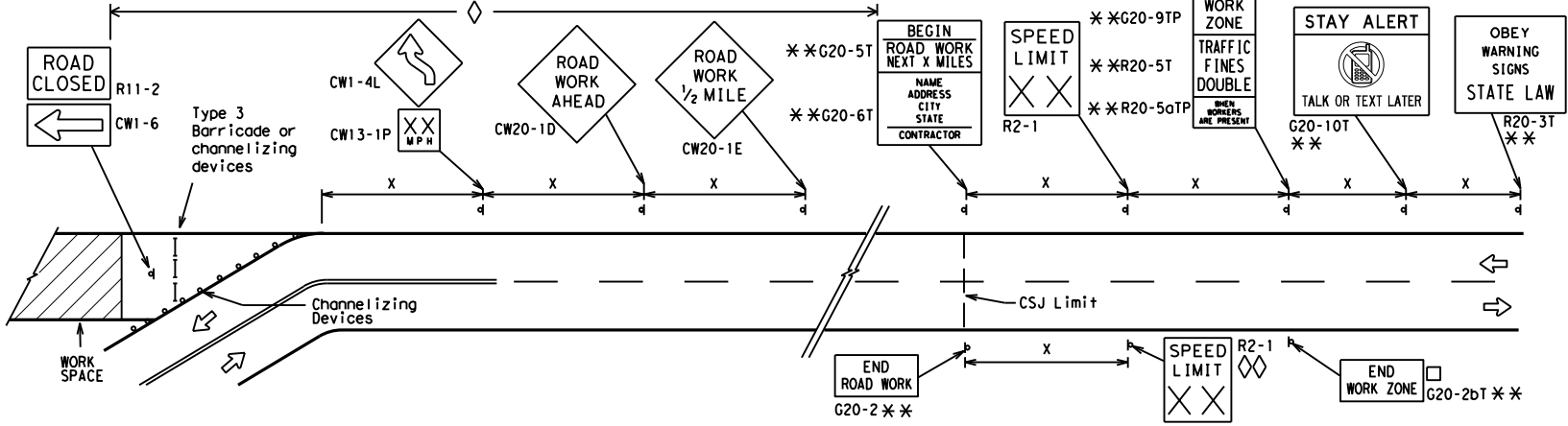
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer as per TMUTCD Part 5. See Note 2 under "Typical Location of Crossroad Signs".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

**WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS**

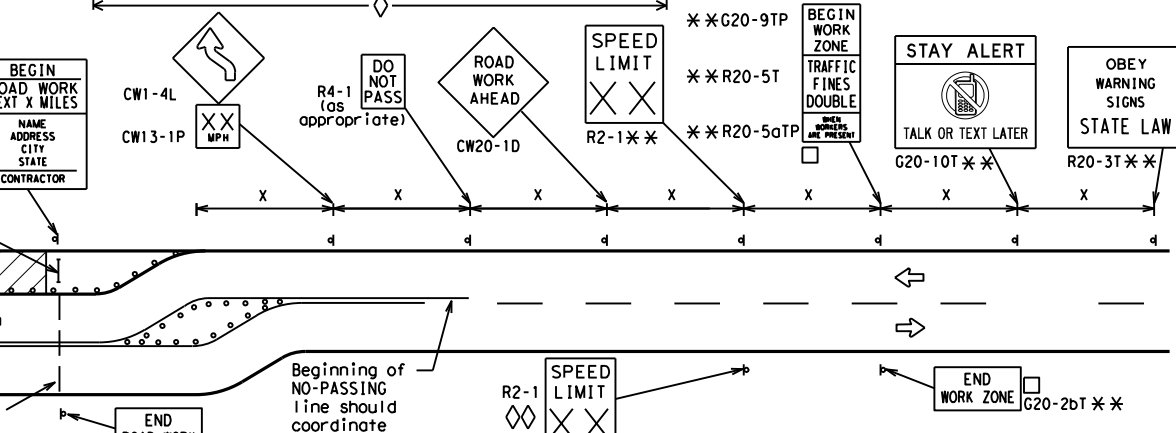


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS**



**SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS**



**NOTES**

- The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "x" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.
- The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.
  - CSJ limit signing is required for highway construction and maintenance work, with the exception of mobile operations.
  - Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.
  - Contractor will install a regulatory speed limit sign at the end of the work zone.

**LEGEND**

—	Type 3 Barricade
○ ○ ○	Channelizing Devices
■	Sign
X	See Typical Construction Warning Sign Size and Spacing chart or the TMUTCD for sign spacing requirements.

SHEET 2 OF 12

**BARRICADE AND CONSTRUCTION PROJECT LIMIT**

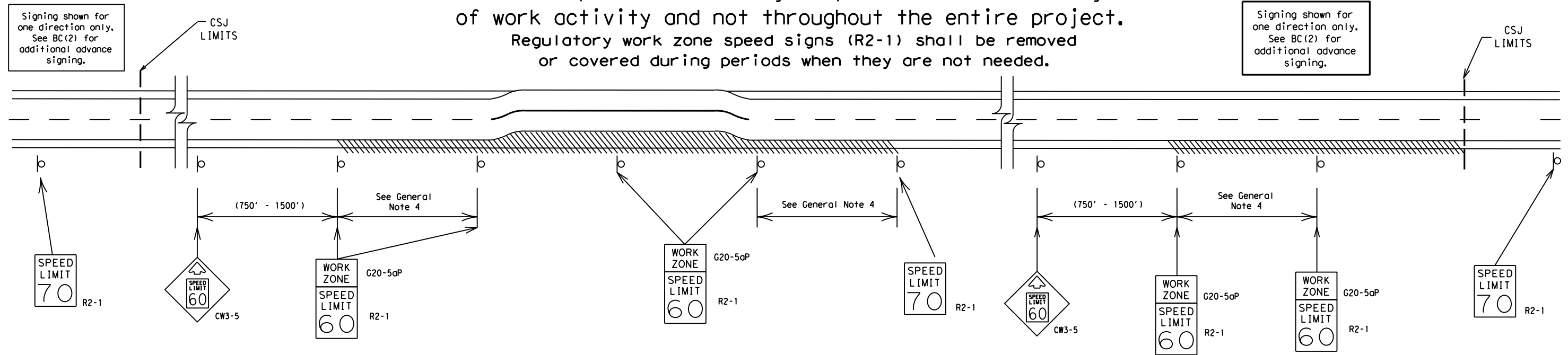
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7-13 5-21	ATL	BOWIE	16	

# TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



## GUIDANCE FOR USE:

### LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

### SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the traveled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

## GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:
 

40 mph and greater	0.2 to 2 miles
35 mph and less	0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - Law enforcement.
  - Flagger stationed next to sign.
  - Portable changeable message sign (PCMS).
  - Low-power (drone) radar transmitter.
  - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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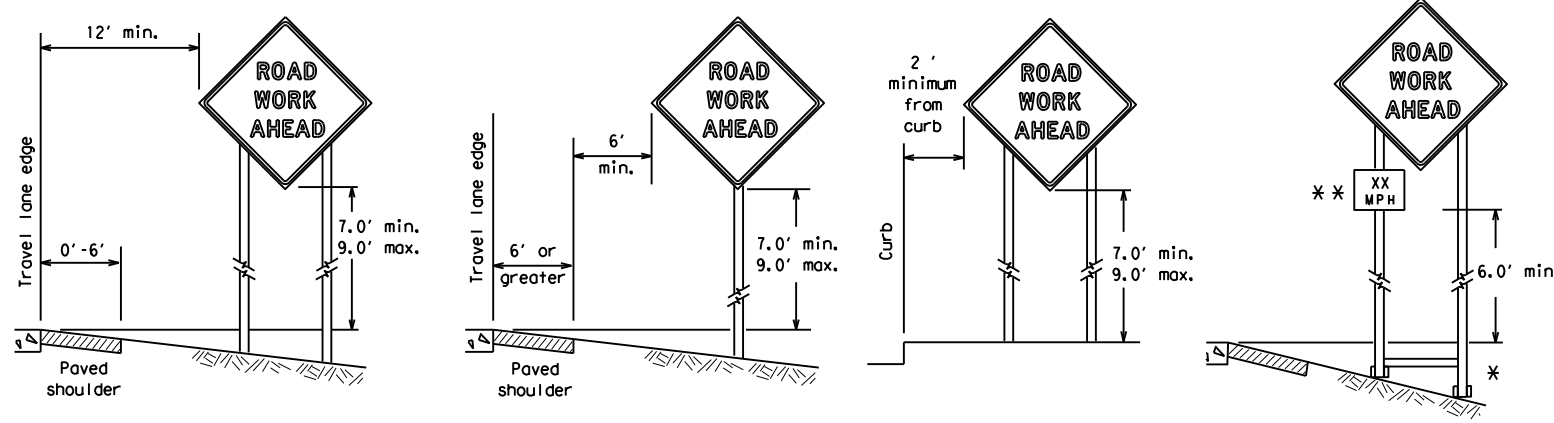
SHEET 3 OF 12

		Traffic Safety Division Standard	
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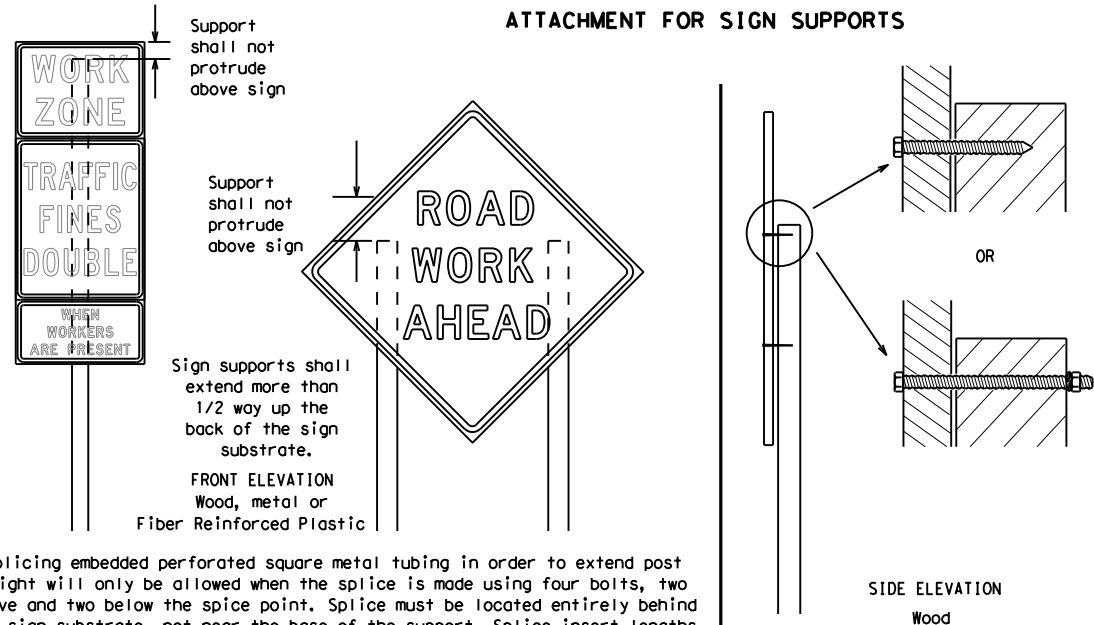
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



\* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

\*\* When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

**ATTACHMENT FOR SIGN SUPPORTS**



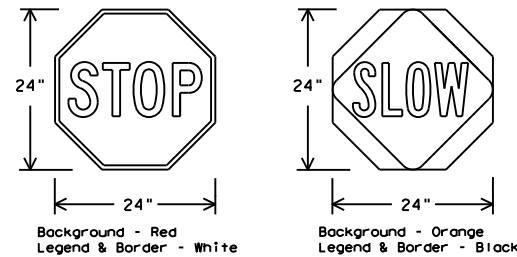
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

**Nails shall NOT be allowed.**  
 Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

**STOP/SLOW PADDLES**

1. STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
2. STOP/SLOW paddles shall be retroreflective when used at night.
3. STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
4. Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



SHEETING REQUIREMENTS (WHEN USED AT NIGHT)		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	ORANGE	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDER	WHITE	TYPE B OR C SHEETING
LEGEND & BORDER	BLACK	ACRYLIC NON-REFLECTIVE FILM

**CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS**

1. Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, specific service (LOGO), or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
2. When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition. For details for covering large guide signs see the TS-CD standard.
3. When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
4. If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
5. If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC standard sheets, TLRs standard sheets or the CWZTCD list. The signs shall meet the required mounting heights shown on the BC, or the SMD standard sheets during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
6. Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

**GENERAL NOTES FOR WORK ZONE SIGNS**

1. Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
2. Wooden sign posts shall be painted white.
3. Barricades shall NOT be used as sign supports.
4. All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
5. The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
6. The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD) for small roadside signs. Supports for temporary large roadside signs shall meet the requirements detailed on the Temporary Large Roadside Signs (TLRS) standard sheets. The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
7. The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
8. Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
9. The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.

**DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**

1. The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
  - a. Long-term stationary - work that occupies a location more than 3 days.
  - b. Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
  - c. Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - d. Short, duration - work that occupies a location up to 1 hour.
  - e. Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

**SIGN MOUNTING HEIGHT**

1. The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
2. The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
3. Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
4. Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
5. Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

**SIZE OF SIGNS**

1. The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

**SIGN SUBSTRATES**

1. The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
2. "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
3. All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

**REFLECTIVE SHEETING**

1. All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
2. White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
3. Orange sheeting, meeting the requirements of DMS-8300 Type B<sub>FL</sub> or Type C<sub>FL</sub>, shall be used for rigid signs with orange backgrounds.

**SIGN LETTERS**

1. All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

**REMOVING OR COVERING**

1. When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
2. Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
3. Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or completely covered when not required.
4. When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will cover the entire sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheeting.
5. Burlap shall NOT be used to cover signs.
6. Duct tape or other adhesive material shall NOT be affixed to a sign face.
7. Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

**SIGN SUPPORT WEIGHTS**

1. Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
2. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
3. Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
4. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
5. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
6. Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
7. Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
8. Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

**FLAGS ON SIGNS**

1. Flags may be used to draw attention to warning signs. When used, the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

SHEET 4 OF 12

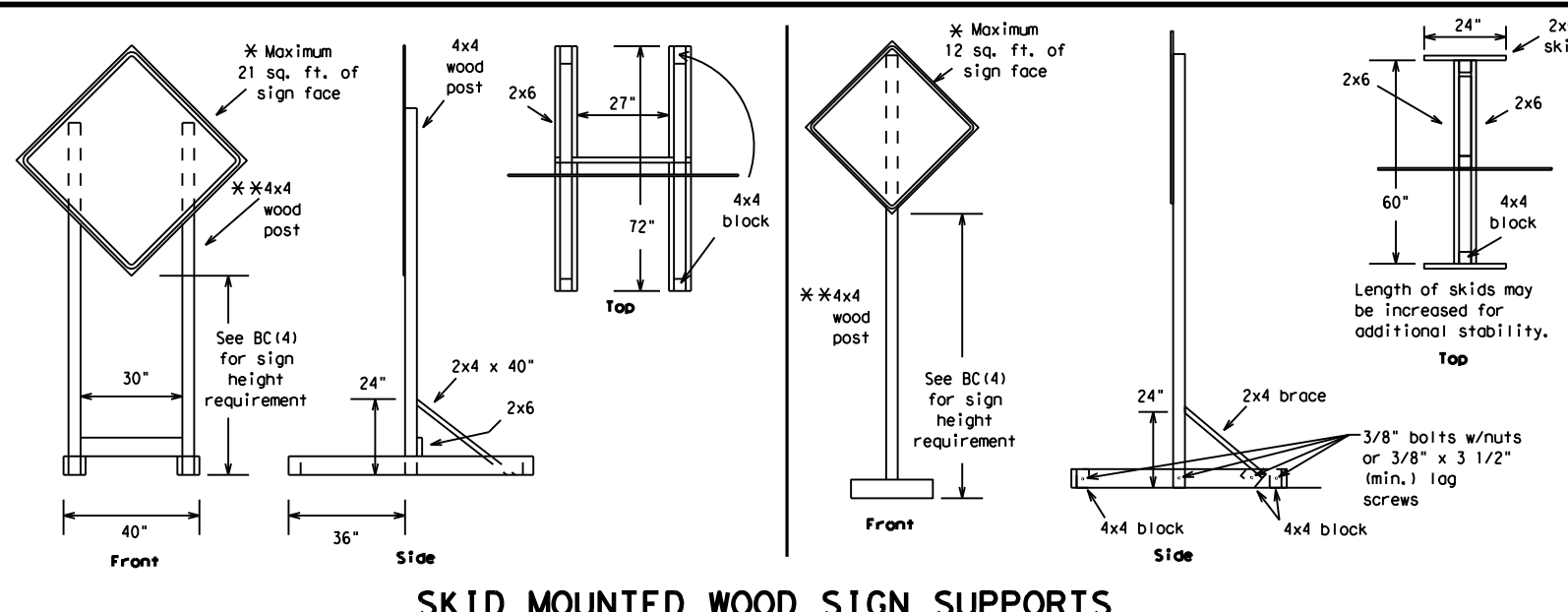


**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

BC (4) - 21

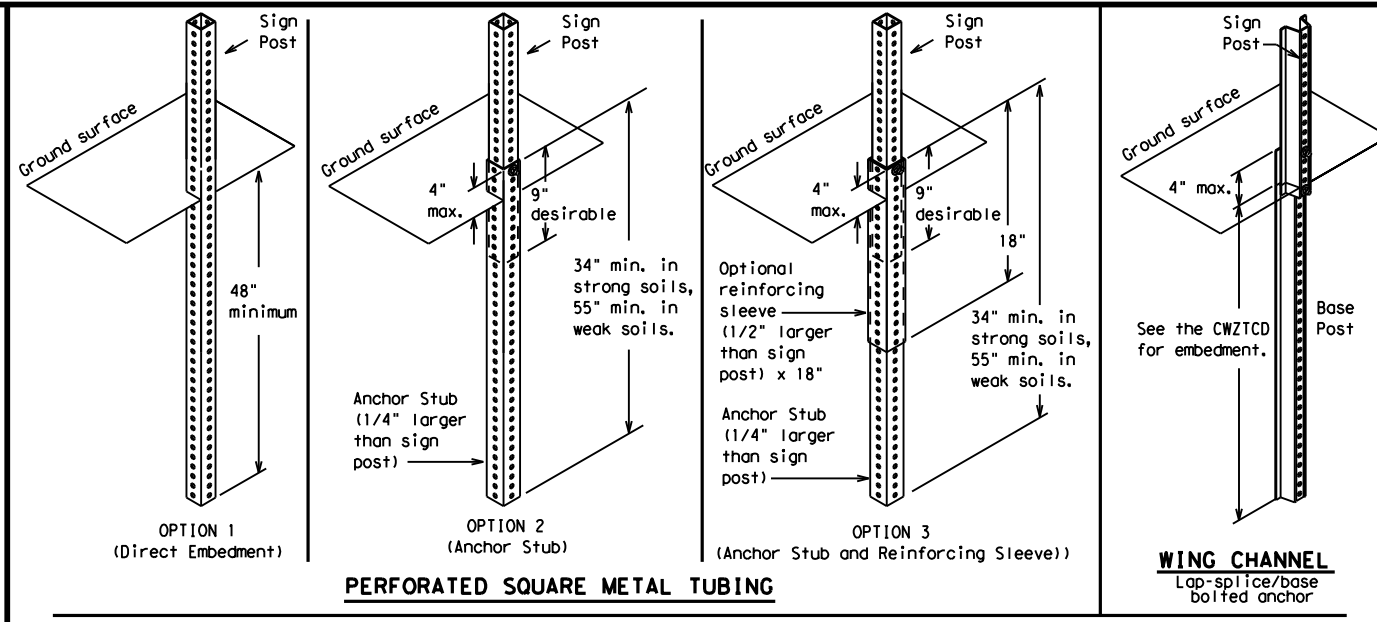
FILE:	bc-21.dgn	DN:	TxDOT	CR:	TxDOT	OW:	TxDOT	CK:	TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0046	06	082	US 82				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	ATL	BOWIE	18					

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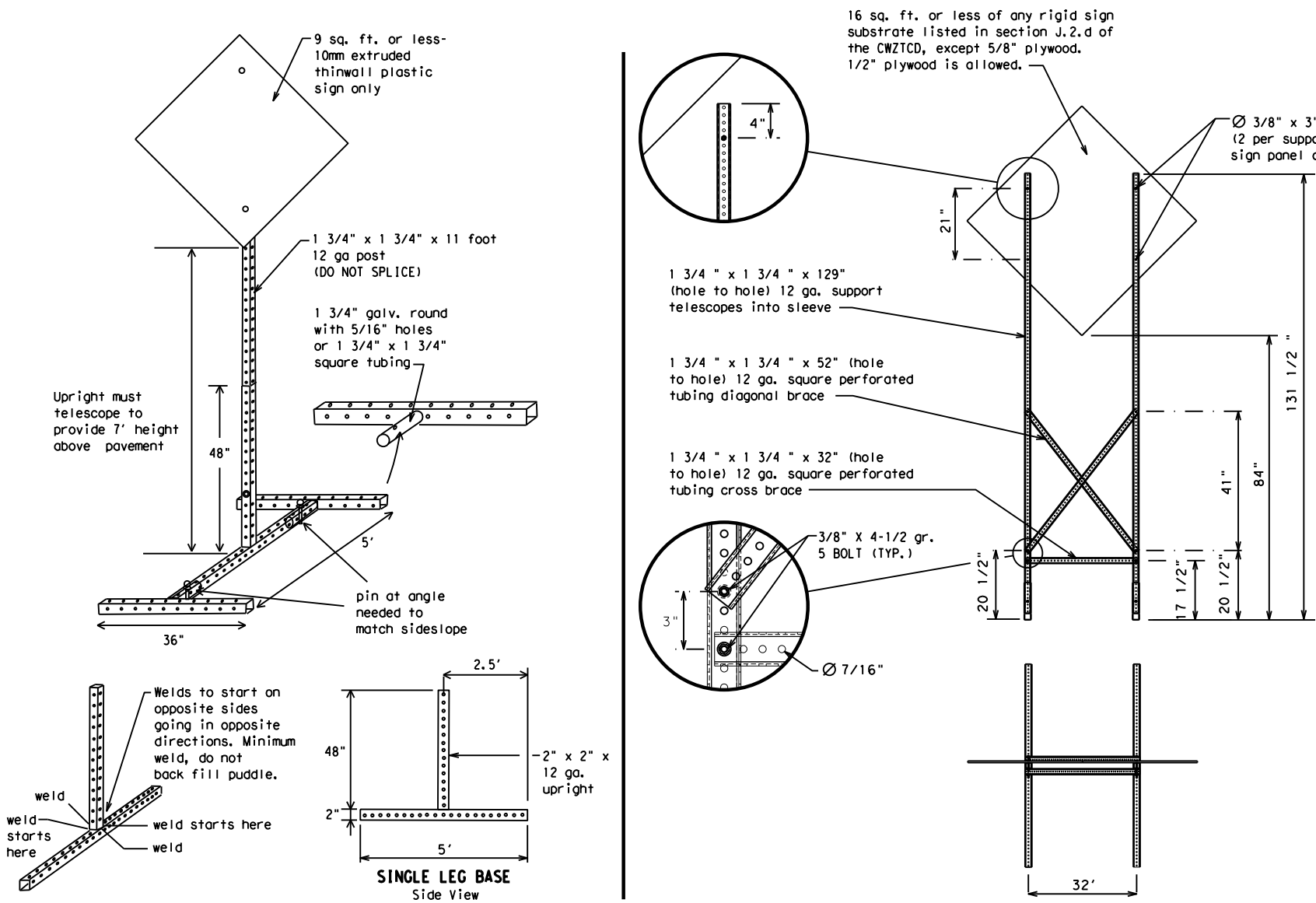
### SKID MOUNTED WOOD SIGN SUPPORTS

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



### GROUND MOUNTED SIGN SUPPORTS

Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support. The maximum sign square footage shall adhere to the manufacturer's recommendation. Two post installations can be used for larger signs.



### SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

### WEDGE ANCHORS

Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

### OTHER DESIGNS

MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

### GENERAL NOTES

- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
- No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
- When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

- \* See BC(4) for definition of "Work Duration."
- \*\* Wood sign posts MUST be one piece. Splicing will NOT be allowed. Posts shall be painted white.
- ☐ See the CWZTCD for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



## BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5) - 21

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© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0046	06	082	US 82				
9-07	8-14	DIST	COUNTY	SHEET NO.					
7-13	5-21	ATL	BOWIE	19					



WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

# RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

## PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use, the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Cannot	CANT	North	N
Center	CTR	Northbound	(route) N
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound	(route) E	Shoulder	SHLDR
Emergency	EMER	Slippery	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound	(route) S
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound	(route) W
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

## Phase 1: Condition Lists

### Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

### Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

\* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

## Phase 2: Possible Component Lists

### Action to Take/Effect on Travel List

MERGE RIGHT
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE

### Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX TO XXXXXX
US XXX TO FM XXXX

### Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

### \*\* Advance Notice List

TUE-FRI XX AM-X PM
APR XX-XX X PM-X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X-X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM-XX AM

\*\* See Application Guidelines Note 6.

## APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

## WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

## FULL MATRIX PCMS SIGNS

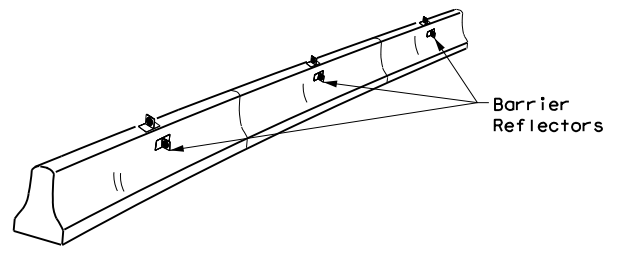
- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the "Flagger Symbol" (CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

SHEET 6 OF 12

<h3>BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)</h3>			
<h2>BC (6) - 21</h2>			
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© TxDOT	November 2002	CONT:	SECT:
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7-13	5-21	ATL	BOWIE
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		SHEET NO.	20

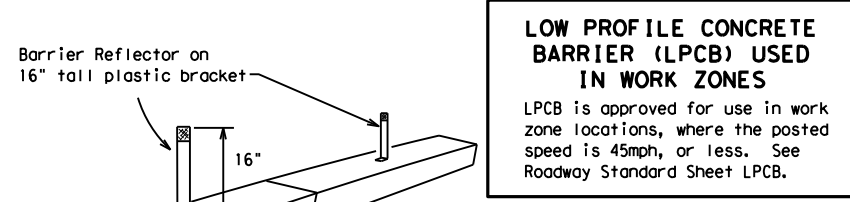
DISCLAIMER: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.  
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.



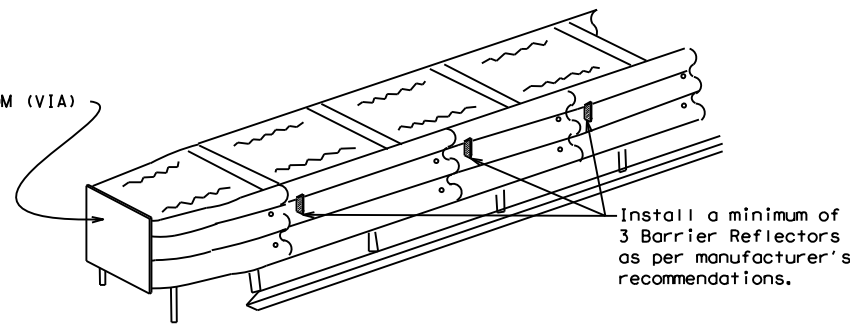
**CONCRETE TRAFFIC BARRIER (CTB)**

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**  
 LPCB is approved for use in work zone locations, where the posted speed is 45mph, or less. See Roadway Standard Sheet LPCB.

**LOW PROFILE CONCRETE BARRIER (LPCB)**



**DELINEATION OF END TREATMENTS**

**END TREATMENTS FOR CTB'S USED IN WORK ZONES**  
 End treatments used on CTB's in work zones shall meet the appropriate crashworthy standards as defined in the Manual for Assessing Safety Hardware (MASH). Refer to the CWZTCD List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

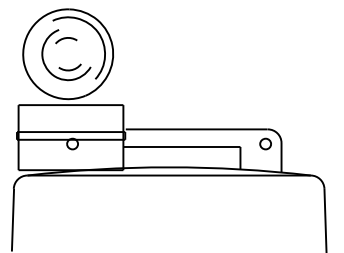
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B<sub>FL</sub> or C<sub>FL</sub> Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

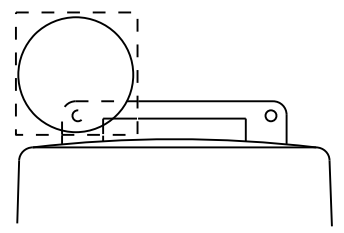
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

**WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS**

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



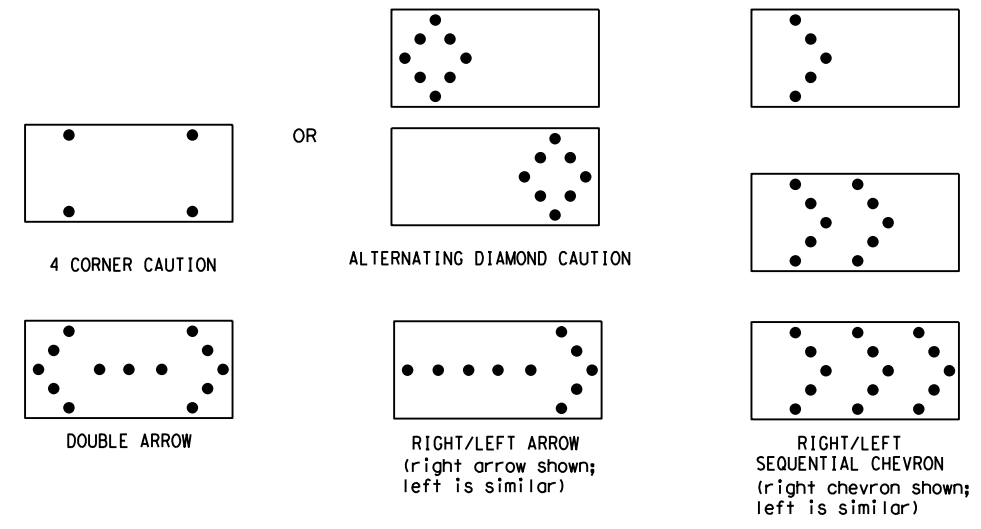
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

- The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

**ATTENTION**  
 Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE THE ARROW BOARD FROM THE RIGHT-OF-WAY OR PLACE THE ARROW BOARD BEHIND CONCRETE TRAFFIC BARRIER OR GUARDRAIL.

**FLASHING ARROW BOARDS**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



**BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR**

**BC (7) -21**

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REVISIONS		0046	06	082	US 82				
9-07	8-14	DIST	COUNTY		SHEET NO.				
7-13	5-21	ATL	BOWIE		21				

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections, one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

**GENERAL DESIGN REQUIREMENTS**

Pre-qualified plastic drums shall meet the following requirements:

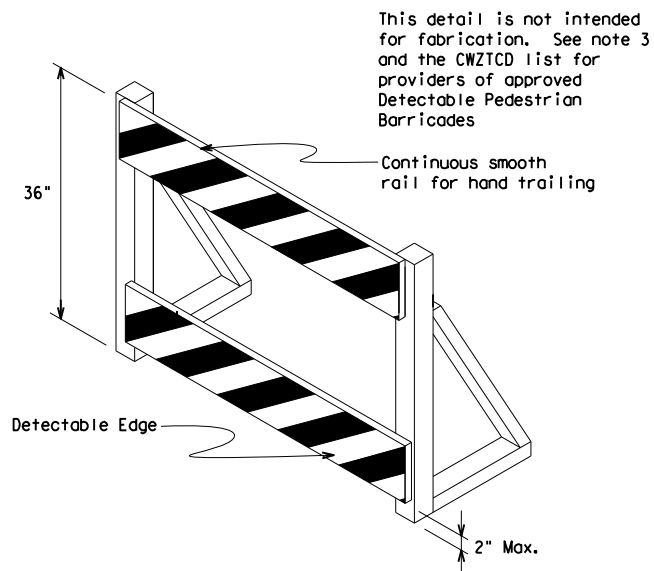
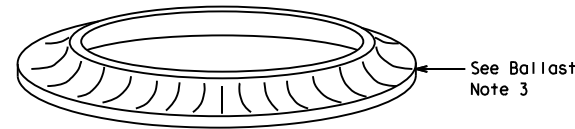
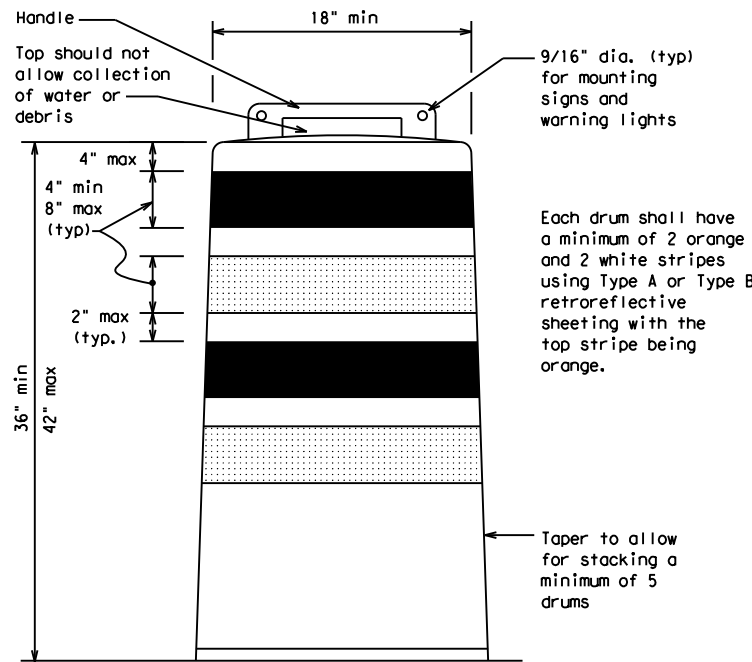
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectORIZED space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

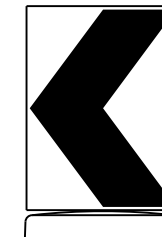
**BALLAST**

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.

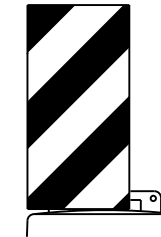


**DETECTABLE PEDESTRIAN BARRICADES**

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Refer to WZ(BTS-2) for Pedestrian Control requirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a Detectable Pedestrian Barricade shall be placed across the full width of the closed sidewalk instead of a Type 3 Barricade.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.



18" x 24" Sign  
(Maximum Sign Dimension)  
Chevron CW1-8, Opposing Traffic Lane Divider, Driveway sign D70a, Keep Right R4 series or other signs as approved by Engineer



12" x 24" Vertical Panel  
mount with diagonals sloping down towards travel way

Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B<sub>FL</sub> or Type C<sub>FL</sub> Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A or Type B. Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When used in these locations, they may be placed on every drum or spaced not more than on every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12



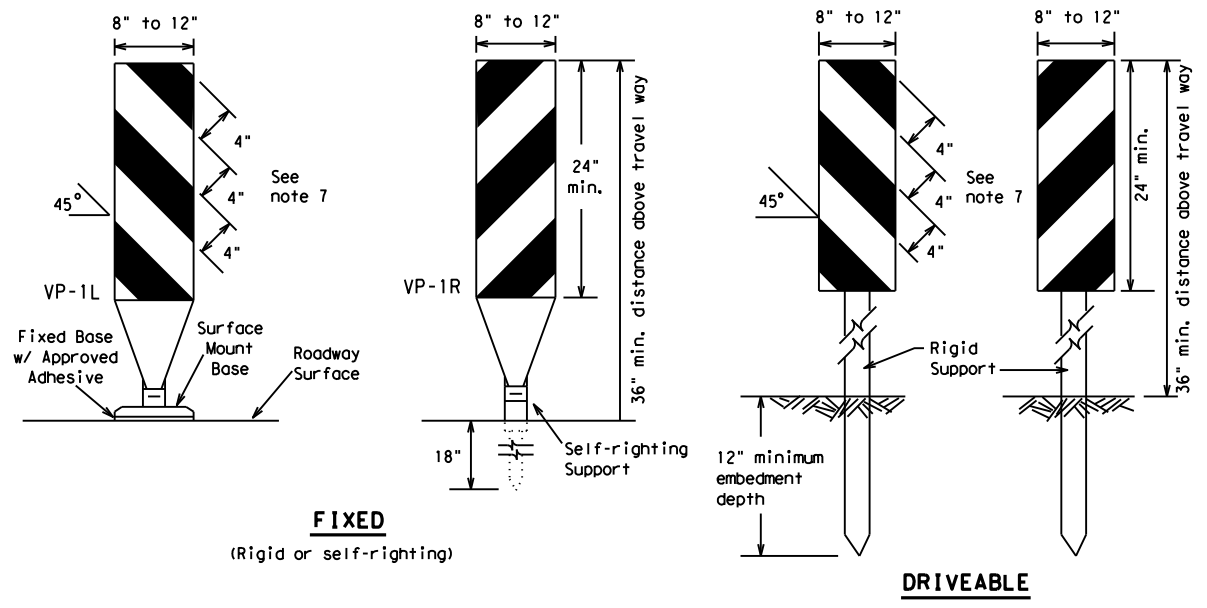
**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (8) - 21**

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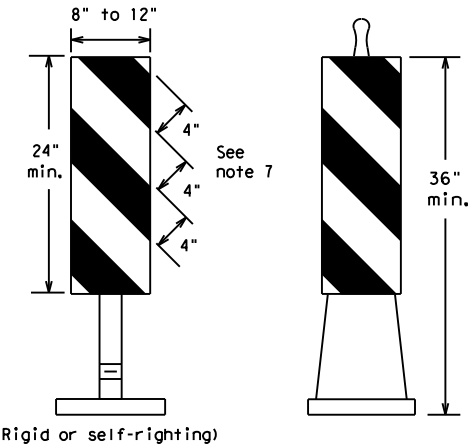
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**FIXED**  
(Rigid or self-righting)

**DRIVEABLE**

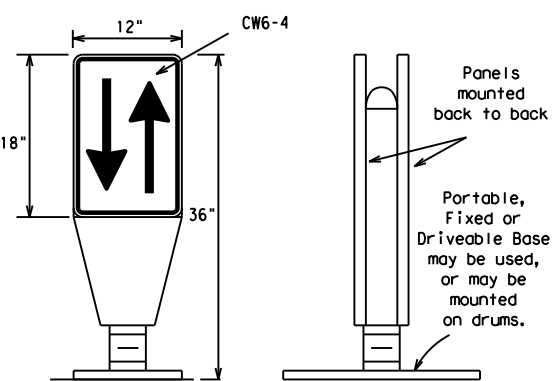


(Rigid or self-righting)

**PORTABLE**

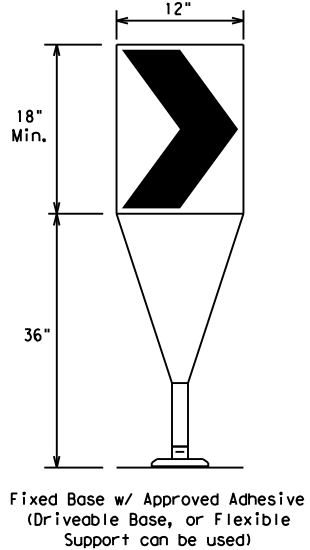
**VERTICAL PANELS (VPs)**

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual for additional requirements on the use VP's for drop-offs.
- VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



**OPPOSING TRAFFIC LANE DIVIDERS (OTLD)**

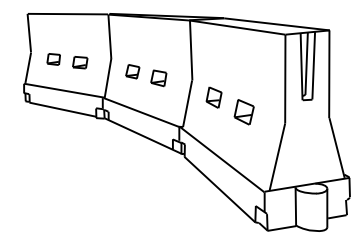
- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B<sub>FL</sub> or Type C<sub>FL</sub> conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways, self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.

**CHEVRONS**



**LONGITUDINAL CHANNELIZING DEVICES (LCD)**

- LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10). Place reflective sheeting near the top of the LCD along the full length of the device.

**WATER BALLASTED SYSTEMS USED AS BARRIERS**

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate Manual for Assessing Safety Hardware (MASH) crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

**HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS**

**GENERAL NOTES**

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

Posted Speed	Formula	Minimum Desirable Taper Lengths * *			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

\* \* \* Taper lengths have been rounded off.  
 L=Length of Taper (FT.) W=Width of Offset (FT.)  
 S=Posted Speed (MPH)

**SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS**

SHEET 9 OF 12



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (9) - 21**

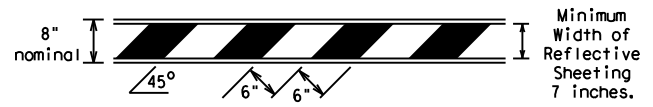
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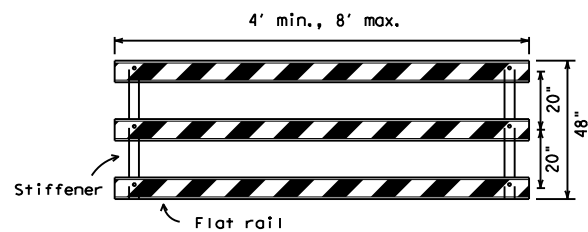
**TYPE 3 BARRICADES**

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road, striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A or Type B conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

Barricades shall NOT be used as a sign support.

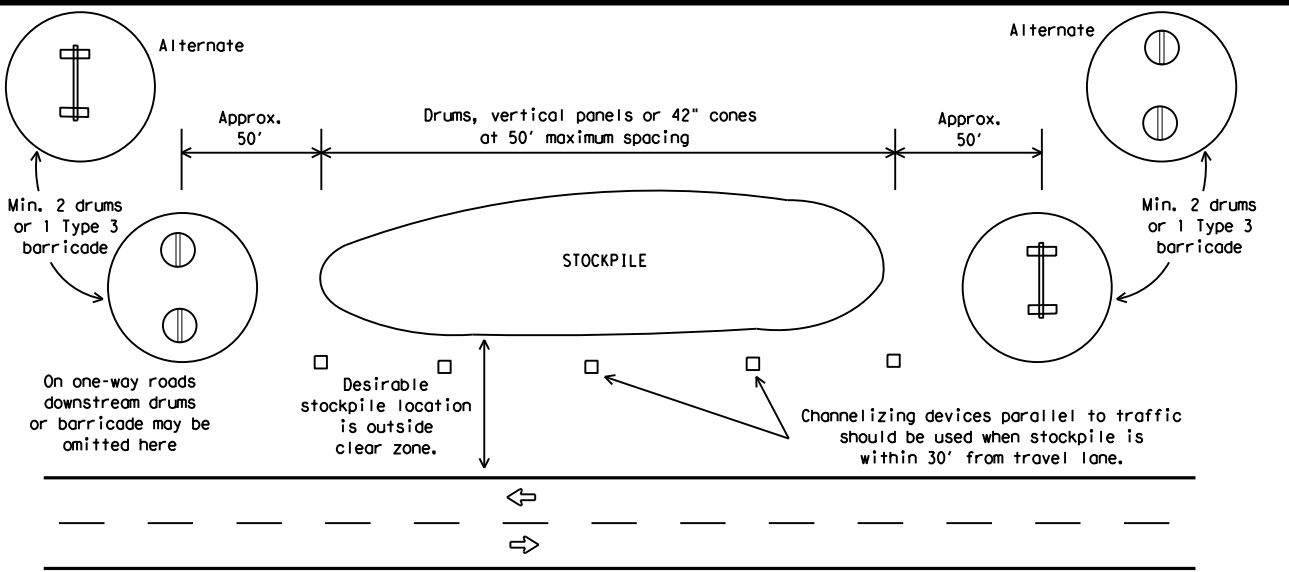


**TYPICAL STRIPING DETAIL FOR BARRICADE RAIL**



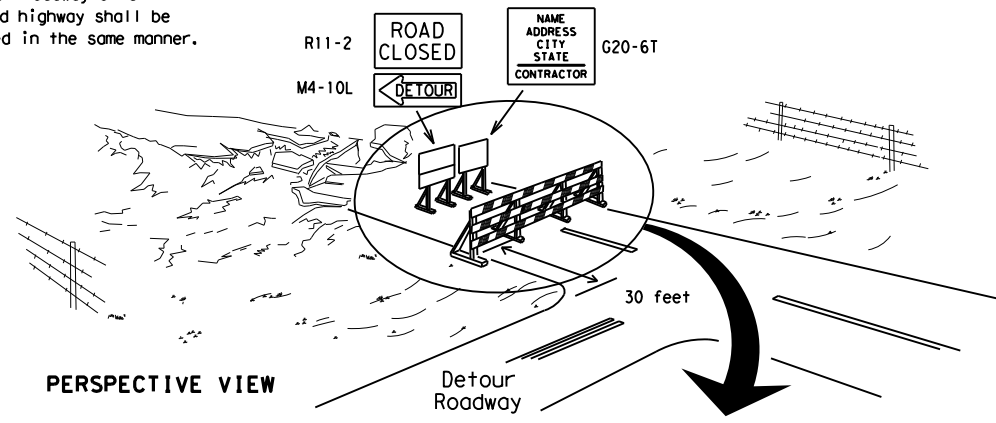
Stiffener may be inside or outside of support, but no more than 2 stiffeners shall be allowed on one barricade.

**TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES**



**TRAFFIC CONTROL FOR MATERIAL STOCKPILES**

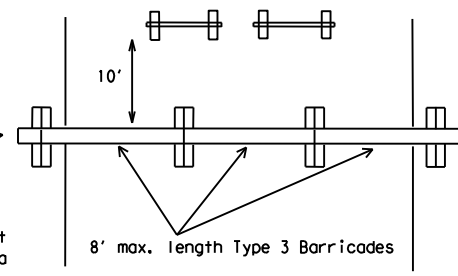
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

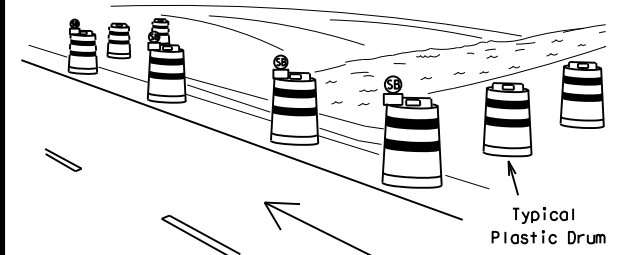
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.

1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

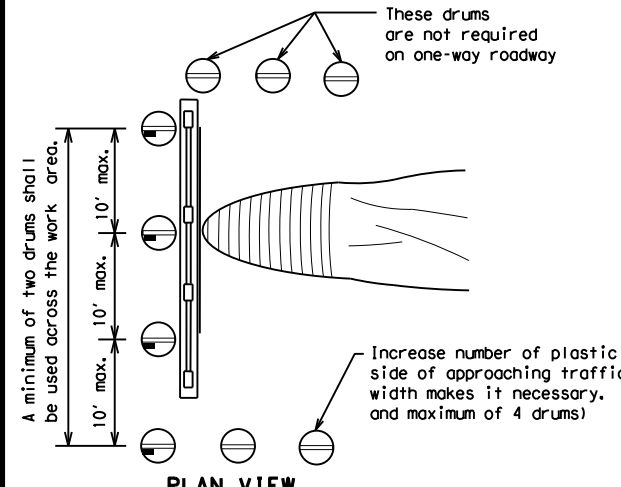


PLAN VIEW

**TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION**



PERSPECTIVE VIEW

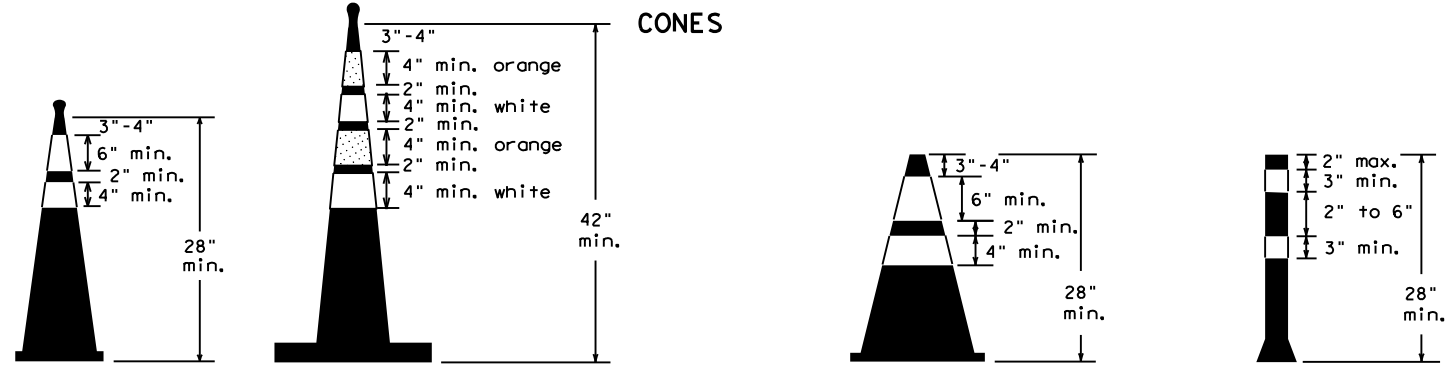


PLAN VIEW

**CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS**

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector



Two-Piece cones

One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.  
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A or Type B.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.



**BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES**

**BC (10) - 21**

FILE: bc-21.dgn	DN: TxDOT	CR: TxDOT	OW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	ATL	BOWIE	24	

## WORK ZONE PAVEMENT MARKINGS

### GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

### RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

### PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

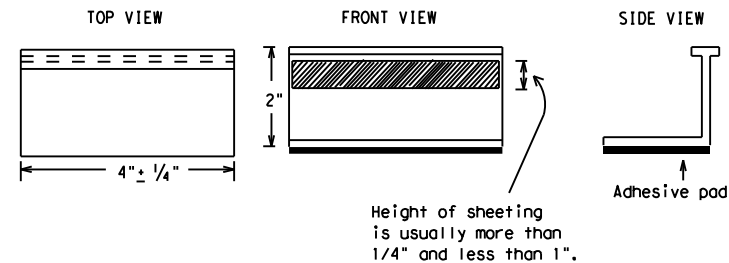
### MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

### REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

## Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE  
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER  
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
  - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
  - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

### RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:  
 YELLOW - (two amber reflective surfaces with yellow body).  
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

SHEET 11 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

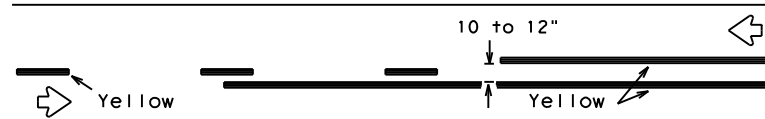
**BC(11)-21**

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© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
2-98 9-07 5-21	DIST	COUNTY	SHEET NO.	
1-02 7-13	ATL	BOWIE	25	
11-02 8-14				

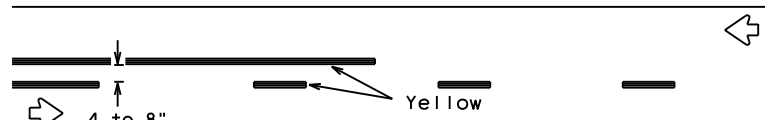
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## PAVEMENT MARKING PATTERNS

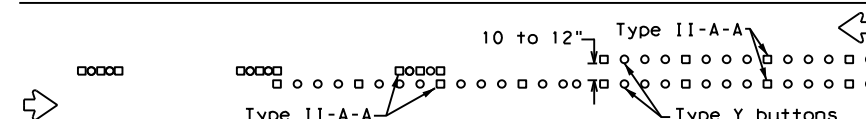


REFLECTORIZED PAVEMENT MARKINGS - PATTERN A

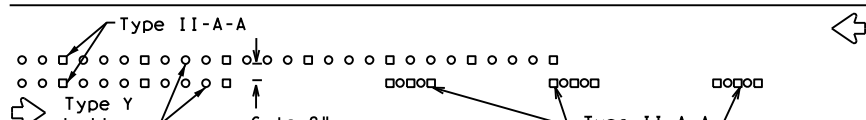


REFLECTORIZED PAVEMENT MARKINGS - PATTERN B

Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectORIZED pavement markings.

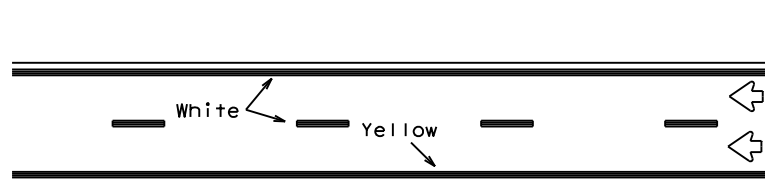


RAISED PAVEMENT MARKERS - PATTERN A



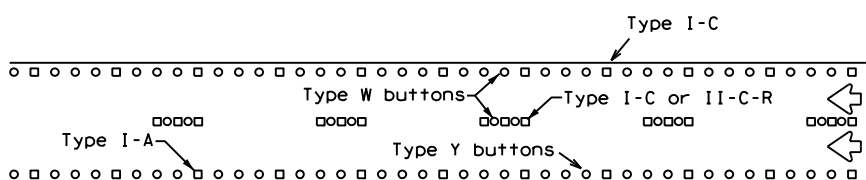
RAISED PAVEMENT MARKERS - PATTERN B

## CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



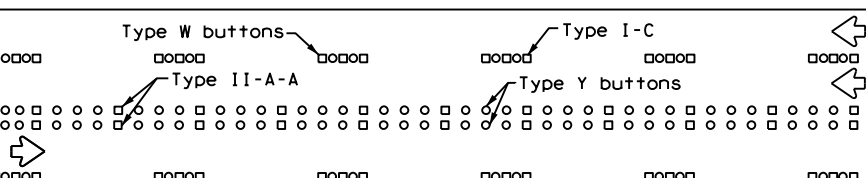
RAISED PAVEMENT MARKERS

## EDGE & LANE LINES FOR DIVIDED HIGHWAY



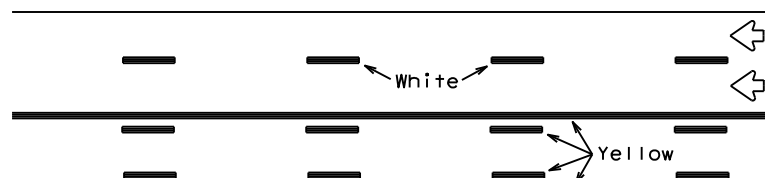
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectORIZED pavement markings.



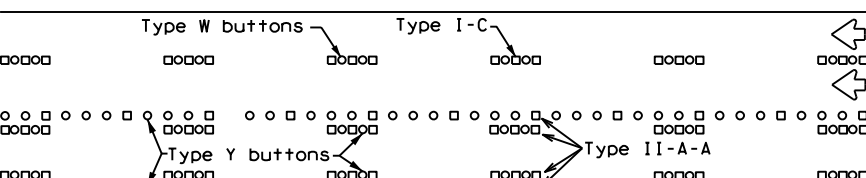
RAISED PAVEMENT MARKERS

## LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

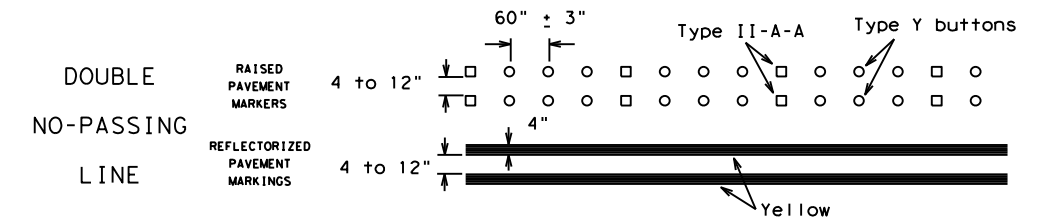
Prefabricated markings may be substituted for reflectORIZED pavement markings.



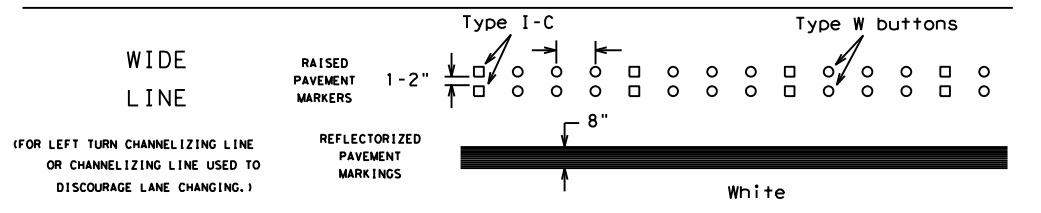
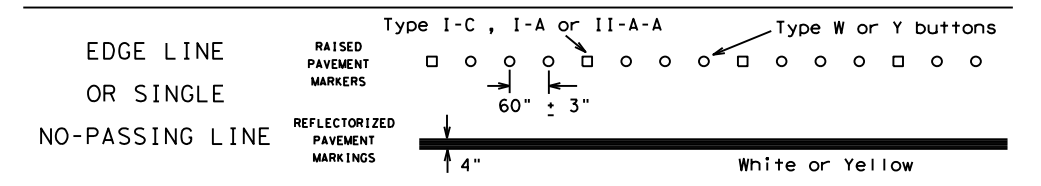
RAISED PAVEMENT MARKERS

## TWO-WAY LEFT TURN LANE

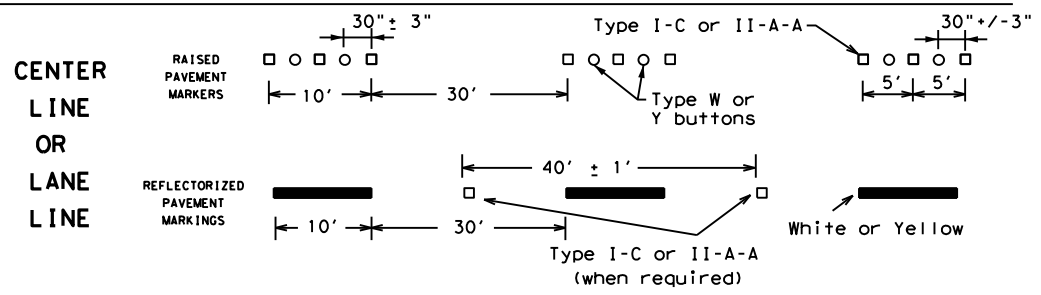
## STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



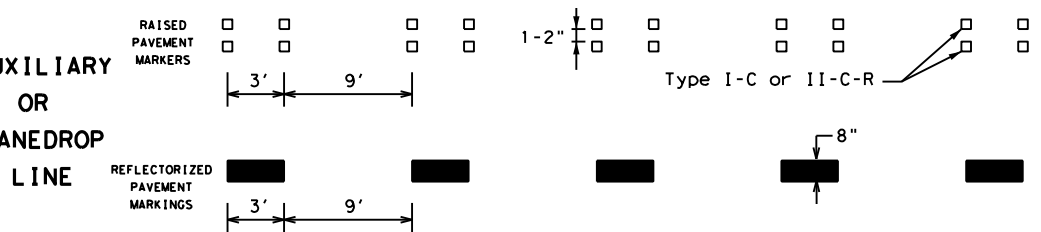
### SOLID LINES



### BROKEN LINES

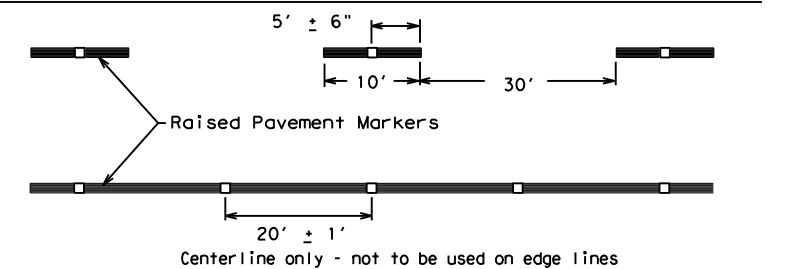


### AUXILIARY OR LANEDROP LINE



### REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



SHEET 12 OF 12



## BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	OW: TxDOT	CR: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
1-97 9-07 5-21	DIST	COUNTY	SHEET NO.	
2-98 7-13	ATL	BOWIE	26	
11-02 8-14				

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

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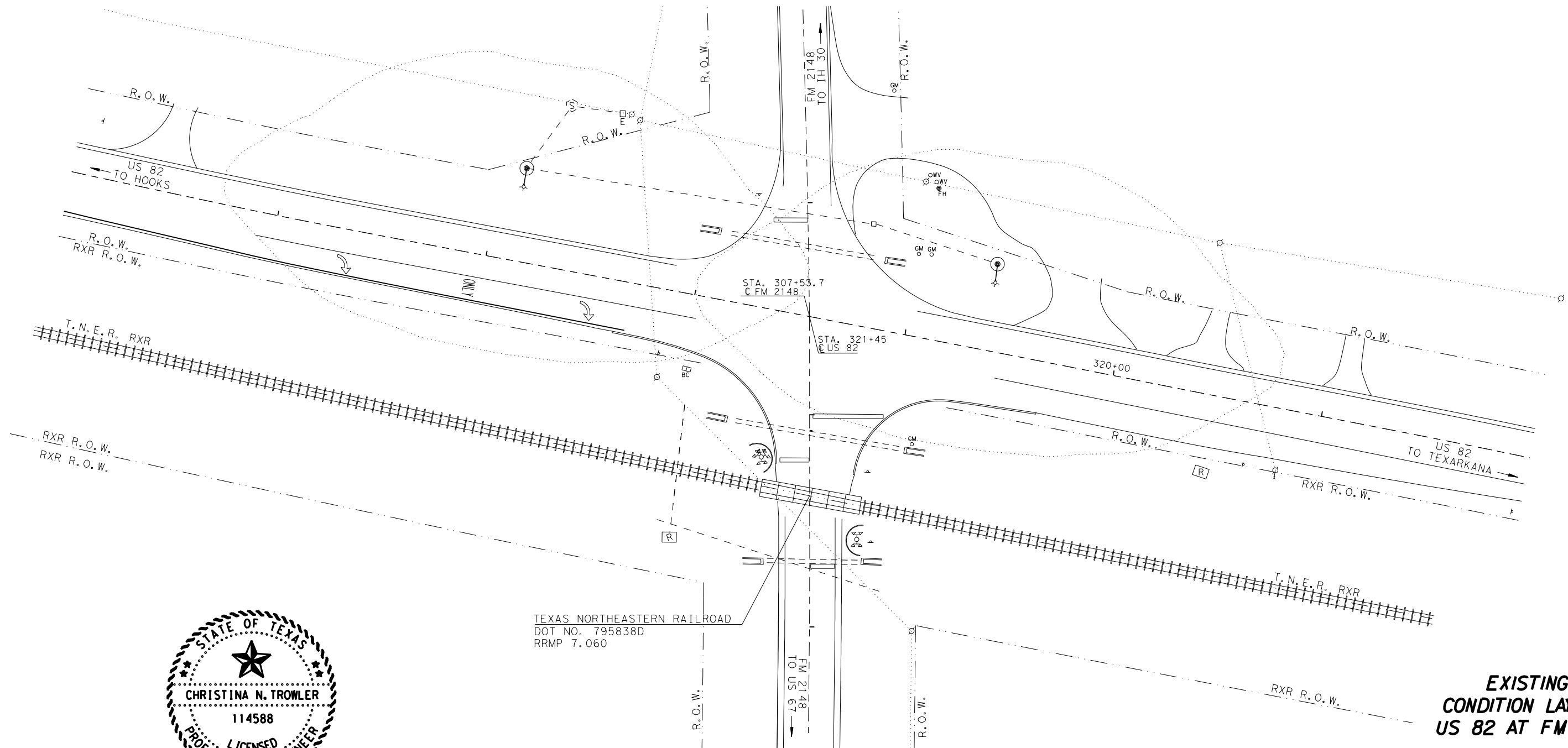
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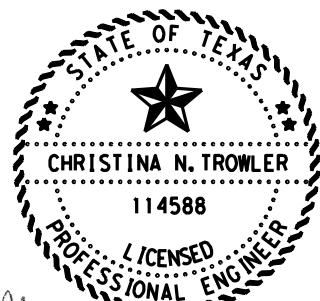


LEGEND

- ⊙ TELEPHONE AND/OR POWER POLE
- ⋯ OVERHEAD POWER LINE
- ELECTRICAL PEDESTAL
- ▭ CULVERT
- ≡≡≡ DRAINAGE PIPE
- ▲ SIGN
- ⊙ GAS MARKER
- ⊙ FH FIRE HYDRANT
- WV WATER VALVE
- ⊞ BURIED CABLE GROUND BOX
- ⊞ RAILROAD SIGNAL CABIN
- ⊞ RAILROAD SIGNAL GATE W/ CIRCULAR GUARDRAIL
- ⊙ EXISTING LUMINAIRE (TY SA) 50T-10(.4KW)S
- ⊞ EXISTING SERVICE
- EXISTING GROUND BOX (TYPE A)
- EXISTING CONDUIT



TEXAS NORTHEASTERN RAILROAD  
 DOT NO. 795838D  
 RRMP 7.060



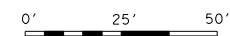
Christina N. Trowler, P.E.

11/30/2021

**EXISTING  
 CONDITION LAYOUT  
 US 82 AT FM 2148**



FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				27
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	





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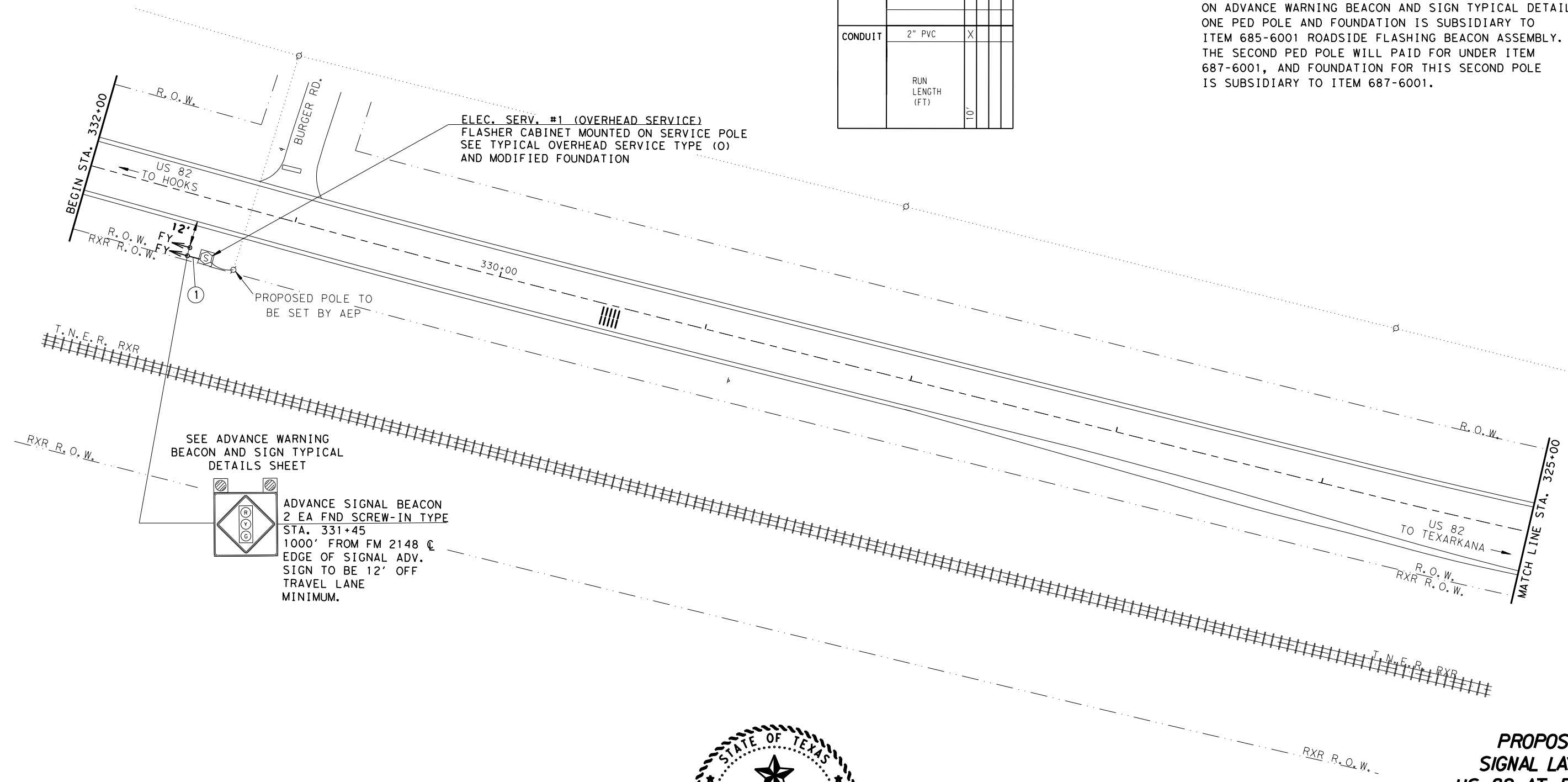


**LEGEND**

	TELEPHONE AND/OR POWER POLE		WIRE RUN NUMBER
	OVERHEAD POWER LINE		ELECTRICAL SERVICE
	SIGN		SIGNAL FACE
	TRENCHED CONDUIT		ROADSIDE FLASHING BEACON

WIRE RUN			
ITEM	RUN	1	
WIRE	#6 BARE	1	
	3/C #12	1	
CONDUIT	2" PVC	X	
	RUN LENGTH (FT)	10'	

- NOTE:**
- AEP TO SET PROPOSED POLE ON THE EDGE OF R.O.W. AND LATERAL TO PROPOSED OVERHEAD SERVICE. FLASHER CABINET TO BE MOUNTED ON PROPOSED OVERHEAD SERVICE. PLACE 6.5' X 6.5' CONCRETE APRON AROUND SERVICE. REFER TO TYPICAL OVERHEAD SERVICE TYPE (O) AND MODIFIED FOUNDATION FOR DETAILS.
  - INSTALL GROUND MOUNT FLASHING BEACON 1000' WEST OF FM 2148 C. THE EDGE OF THE PROPOSED SIGN TO BE 12' MINIMUM OFF THE EDGE OF THE TRAVEL LANE.
  - INSTALL GROUND MOUNT FLASHING BEACON AS SHOWN ON ADVANCE WARNING BEACON AND SIGN TYPICAL DETAILS. ONE PED POLE AND FOUNDATION IS SUBSIDIARY TO ITEM 685-6001 ROADSIDE FLASHING BEACON ASSEMBLY. THE SECOND PED POLE WILL PAID FOR UNDER ITEM 687-6001, AND FOUNDATION FOR THIS SECOND POLE IS SUBSIDIARY TO ITEM 687-6001.



SEE ADVANCE WARNING BEACON AND SIGN TYPICAL DETAILS SHEET

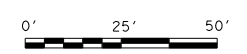
ADVANCE SIGNAL BEACON  
 2 EA FND SCREW-IN TYPE  
 STA. 331+45  
 1000' FROM FM 2148 C  
 EDGE OF SIGNAL ADV.  
 SIGN TO BE 12' OFF  
 TRAVEL LANE  
 MINIMUM.

CHRISTINA N. TROWLER  
 114588  
 LICENSED PROFESSIONAL ENGINEER  
*Christina N. Trowler, P.E.*  
 11/30/2021

**PROPOSED  
 SIGNAL LAYOUT  
 US 82 AT FM 2148**

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 SHEET 1 OF 4

FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				28
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



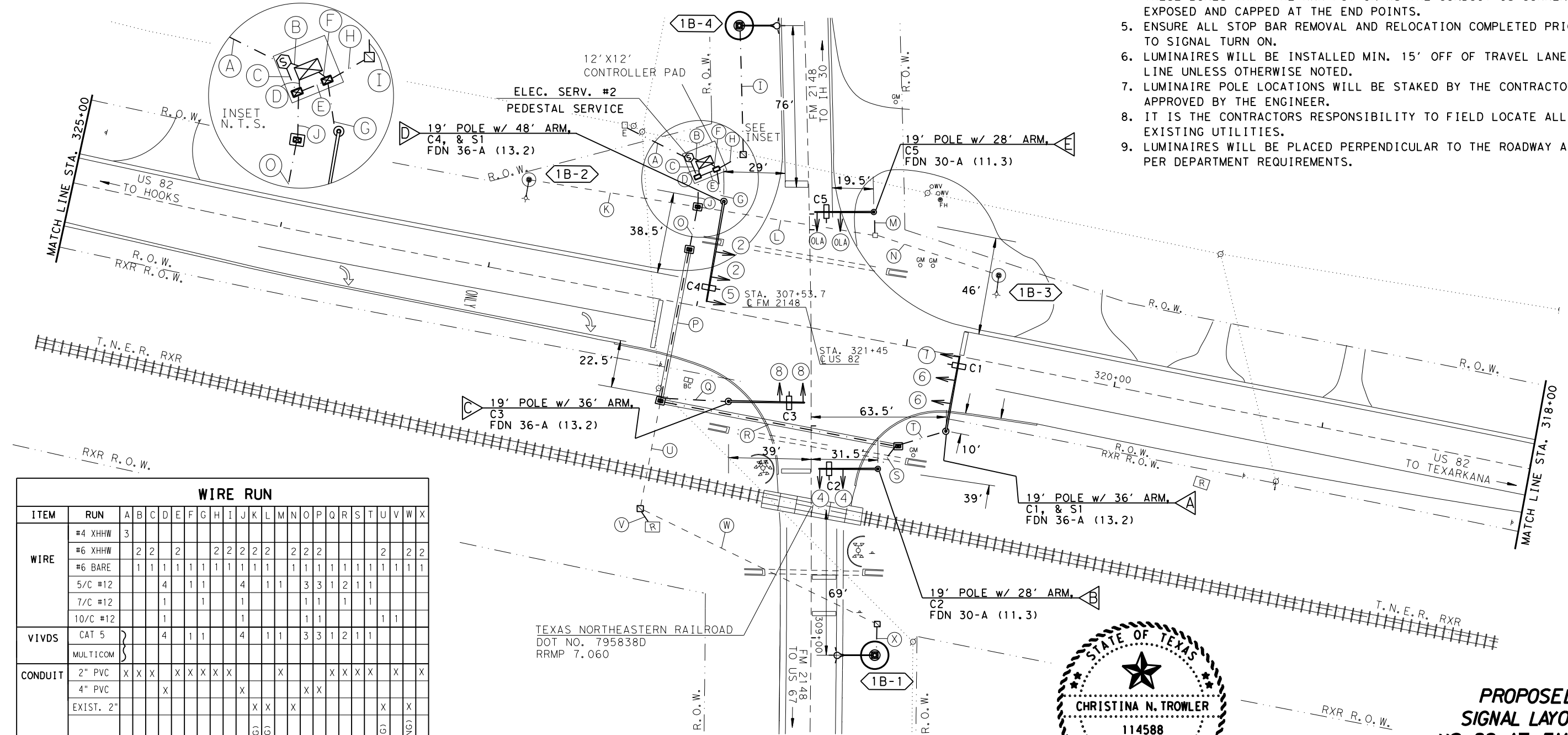
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 DATE: 11/19/2021 7:33:00 AM

LEGEND

- TELEPHONE AND/OR POWER POLE
- OVERHEAD POWER LINE
- ELECTRICAL PEDESTAL
- ▬ CULVERT
- DRAINAGE PIPE
- ▲ SIGN
- GAS MARKER
- FIRE HYDRANT
- WATER VALVE
- ▭ BURIED CABLE GROUND BOX
- RAILROAD SIGNAL CABIN
- RAILROAD SIGNAL GATE W/ CIRCULAR GUARDRAIL
- EXISTING LUMINAIRE (TY SA) 50T-10(.4KW)S
- 1B-1 LUMINAIRE CIRCUIT & POLE NUMBER
- EXISTING SERVICE
- EXISTING GROUND BOX (TYPE A)
- EXISTING CONDUIT
- POLE W/MAST ARM
- CONTROLLER
- ② SIGNAL FACE AND PHASE
- GROUND BOX (TY A) (122311) w/ APRON
- GROUND BOX (TY D) (162922)
- GROUND BOX (TY D) (162922) w/ APRON
- ▬ PROPOSED CONDUIT (BORE)
- ▬ PROPOSED CONDUIT (TRENCH)
- PROPOSED LUMINAIRE (TY SA) 50T-10(.4KW)S

NOTE:

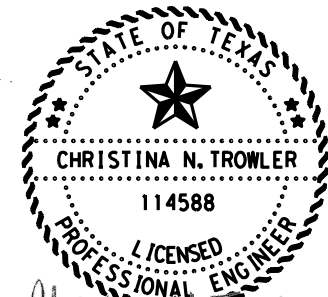
1. REMOVE EXISTING SERVICE UNDER ITEM 628-6002 REMOVE ELECTRICAL SERVICES. LUMINAIRES WILL BE POWERED FROM THE PROPOSED SERVICE FROM THE TRAFFIC SIGNAL.
2. SET PROPOSED GROUND BOX IN THE NW QUADRANT AT EXISTING CONDUIT FOR LUMINAIRES. PULL NEW WIRE TO THE EXISTING LUMINAIRES AND THE PROPOSED LUMINAIRES.
3. STUB UP IN THE EXISTING GROUND BOX IN THE NE QUADRANT TO RUN SIGNAL WIRE TO POLE E.
4. RUN PRE-EMPTION WIRE FROM SIGNAL CONTROLLER CABINET TO RXR SIGNAL CABIN. USE EXISTING CONDUIT PLACED BY RXR UNDERNEATH TRACKS, AND CROSSING FM 2148 SOUTH TO CARRY RXR PRE-EMPTION WIRE, AND TO POWER LUMINAIRE 1B-1 SOUTH OF THE CROSSING. CONTRACTOR WILL NEED TO SET GROUND BOXES AT END POINTS OF THESE BORES THAT THE RXR PUT IN AS THE CONDUIT IS CURRENTLY EXPOSED AND CAPPED AT THE END POINTS.
5. ENSURE ALL STOP BAR REMOVAL AND RELOCATION COMPLETED PRIOR TO SIGNAL TURN ON.
6. LUMINAIRES WILL BE INSTALLED MIN. 15' OFF OF TRAVEL LANE LINE UNLESS OTHERWISE NOTED.
7. LUMINAIRE POLE LOCATIONS WILL BE STAKED BY THE CONTRACTOR AND APPROVED BY THE ENGINEER.
8. IT IS THE CONTRACTORS RESPONSIBILITY TO FIELD LOCATE ALL EXISTING UTILITIES.
9. LUMINAIRES WILL BE PLACED PERPENDICULAR TO THE ROADWAY AS PER DEPARTMENT REQUIREMENTS.



WIRE RUN		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
WIRE	#4 XHHW	3																							
	#6 XHHW	2	2	2				2	2	2	2	2	2	2	2	2	2					2	2	2	
	#6 BARE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	5/C #12			4	1	1			4	1	1			3	3	1	2	1	1	1	1	1	1	1	
	7/C #12					1																			
10/C #12			1																				1	1	
VIVDS	CAT 5			4	1	1			4	1	1			3	3	1	2	1	1						
	MULTICOM																								
CONDUIT	2" PVC	X	X	X	X	X	X	X	X					X	X	X	X	X	X	X	X	X	X	X	
	4" PVC				X					X	X														
	EXIST. 2"										X	X	X									X	X		
RUN LENGTH (FT)	35'																								
	5'																								
	10'																								
	5'																								
	5'																								
	16'																								
	15'																								
	61'																								
	14'																								
	80' (EXISTING)																								
85' (EXISTING)																									
11'																									
62'																									
21'																									
73' (BORE)																									
32'																									
115' (BORE)																									
14'																									
26'																									
52' (EXISTING)																									
11'																									
125' (EXISTING)																									
15'																									

WIRE RUNS ARE FROM GROUND BOX TO GROUND BOX. FINAL QUANTITIES INCLUDE TOTAL AMOUNT OF CONDUCTOR REQUIRED FOR OPERATION.

POLE	TYPE	FND. (LF)	REMARKS
1B-1	(TY SA)50T-10(400W)LED	10	69' SOUTH OF CENTER OF RXR TRACK AND 15' OFF EDGELINE
1B-2	(TY SA)50T-10(400W)LED		EXISTING
1B-3	(TY SA)50T-10(400W)LED		EXISTING
1B-4	(TY SA)40T-10(400W)LED	10	76' NORTH OF PROPOSED STOP BAR AND 17' OFF EDGELINE



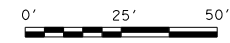
Christina N. Trowler, P.E.

11/30/2021

PROPOSED SIGNAL LAYOUT US 82 AT FM 2148

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STATE	DISTRICT	COUNTY
TEXAS	ATL	BOWIE
CONTROL	SECTION	JOB
0046	06	082
CONSTRUCTION PROJECT NO.		SHEET NO.
		29
HIGHWAY NO.		
0046		US 82

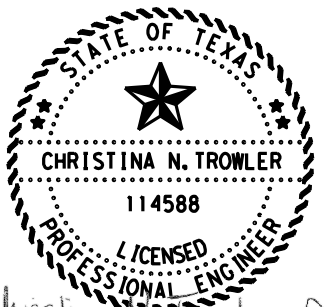
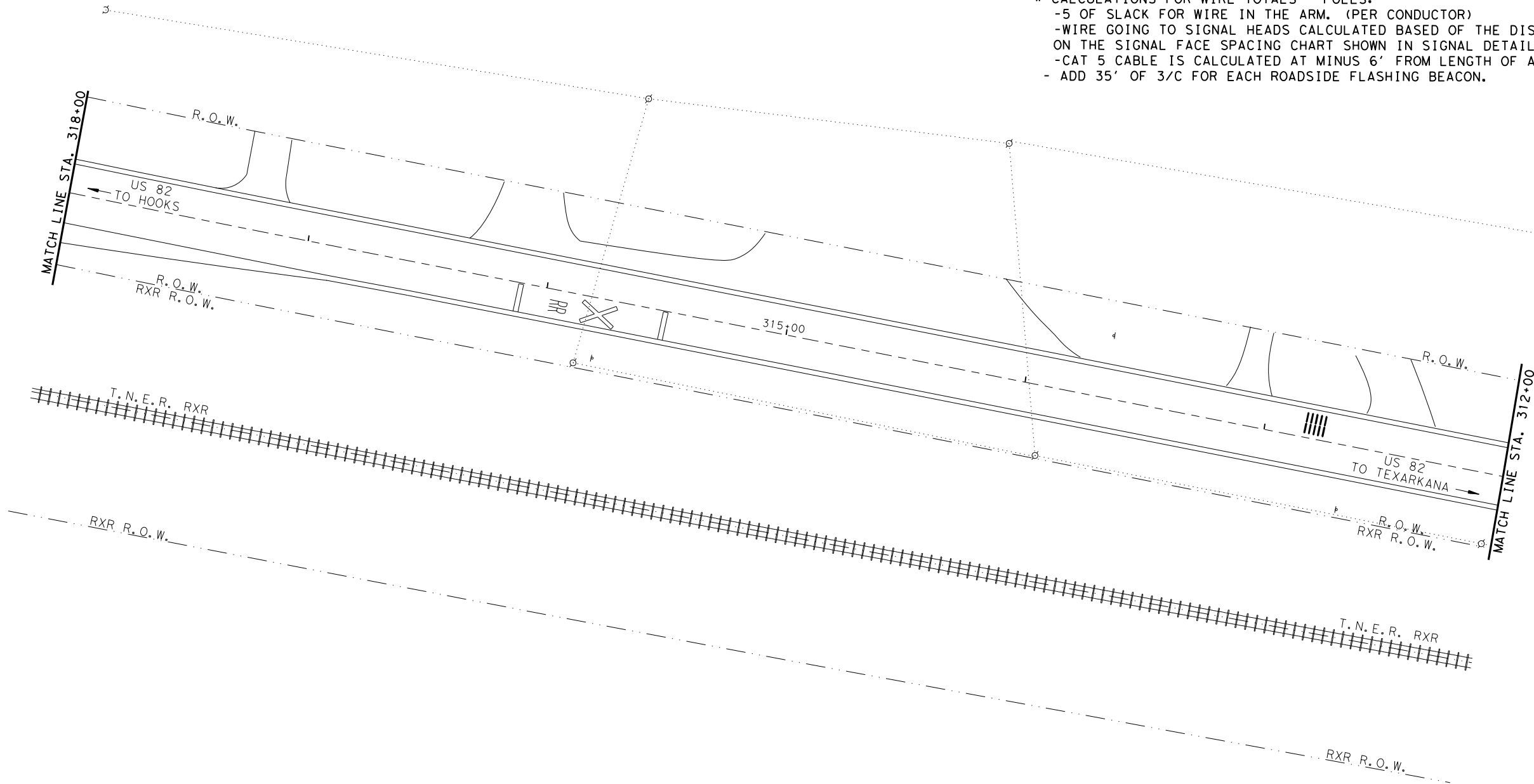


WIRE TOTALS - CONDUIT																				TOTAL								
ITEM	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	1	2		
#4 XHH	120																											120
#6 XHHW		40	40		30			40	132	38	170	180		134	52	156					114		260	40				1426
#6 BARE		20	20	25	15	20	26	20	66	19	85	90		67	26	78	42	120	24	36	57	21	130	20	20	28	1075	
3/C #12																									20	28	48	
5/C #12				100		20	26				76		90	16		78	234	42	240	24	36						982	
7/C #12				20		20	21			19						78		120		31							309	
10/C #12				25						19					26	78					57	21					226	
CAT 5				100		20	26			76		90	16		78	234	42	240	24	36							982	

WIRE TOTALS - POLES				
POLE #	5/C #12	7/C #12	CAT 5	3C#12
A	84	60	54	
B	93		46	
C	108		54	
D	108	72	66	
E	93		46	
RFB-1				35
RFB-2				35
TOTAL	486	132	266	70



- \* CALCULATIONS FOR WIRE TOTALS - CONDUIT:
  - 5' OF SLACK FOR GROUND BOXES. (PER CONDUCTOR)
  - 5' OF SLACK FOR WIRE IN THE SERVICE. (PER CONDUCTOR)
  - 5' OF SLACK FOR WIRE IN THE BASE OF ILLUMINATION POLES. (PER CONDUCTOR)
  - 10' OF SLACK FOR WIRE IN THE CABINET AND BASE OF TRAFFIC SIGNAL POLES. (PER CONDUCTOR)
  - 10' OF SLACK FOR WIRE IN THE RXR SIGNAL HOUSE FOR 10/C.
- \* CALCULATIONS FOR WIRE TOTALS - POLES:
  - 5 OF SLACK FOR WIRE IN THE ARM. (PER CONDUCTOR)
  - WIRE GOING TO SIGNAL HEADS CALCULATED BASED OF THE DISTANCES SHOWN ON THE SIGNAL FACE SPACING CHART SHOWN IN SIGNAL DETAILS.
  - CAT 5 CABLE IS CALCULATED AT MINUS 6' FROM LENGTH OF ARM.
  - ADD 35' OF 3/C FOR EACH ROADSIDE FLASHING BEACON.

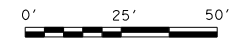


Christina N. Trowler, P.E.  
11/30/2021

**PROPOSED  
SIGNAL LAYOUT  
US 82 AT FM 2148**

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SHEET 3 OF 4

FHWA TEXAS DIVISION	CONSTRUCTION PROJECT NO.		SHEET NO.
			30
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



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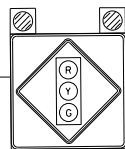
LEGEND

- ⊘ TELEPHONE AND/OR POWER POLE
- ⊙ WIRE RUN NUMBER
- ⋯ OVERHEAD POWER LINE
- Ⓢ ELECTRICAL SERVICE
- Ⓜ RXR SIGNAL
- ➔ SIGNAL FACE
- - - TRENCHED CONDUIT
- ⓈⓈ ROADSIDE FLASHING BEACON

NOTE:

1. AEP TO SET PROPOSED POLE ON THE EDGE OF R.O.W. AND LATERAL TO PROPOSED OVERHEAD SERVICE. FLASHER CABINET TO BE MOUNTED ON PROPOSED OVERHEAD SERVICE. PLACE 6.5' X 6.5' CONCRETE APRON AROUND SERVICE. REFER TO TYPICAL TYPICAL OVERHEAD SERVICE TYPE (O) AND MODIFIED FOUNDATION FOR DETAILS.
2. INSTALL GROUND MOUNT FLASHING BEACON 1066' EAST OF FM 2148 @. THE EDGE OF THE PROPOSED SIGN TO BE 14.5' MINIMUM OFF THE EDGE OF THE TRAVEL LANE.
3. INSTALL GROUND MOUNT FLASHING BEACON AS SHOWN ON ADVANCE WARNING BEACON AND SIGN TYPICAL DETAILS. ONE PED POLE AND FOUNDATION IS SUBSIDIARY TO ITEM 685-6001 ROADSIDE FLASHING BEACON ASSEMBLY. THE SECOND PED POLE WILL PAID FOR UNDER ITEM 687-6001, AND FOUNDATION FOR THIS SECOND POLE IS SUBSIDIARY TO ITEM 687-6001.

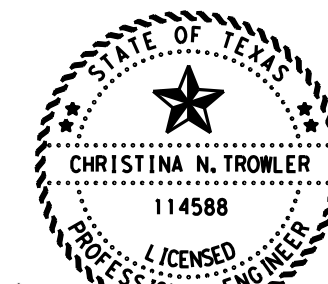
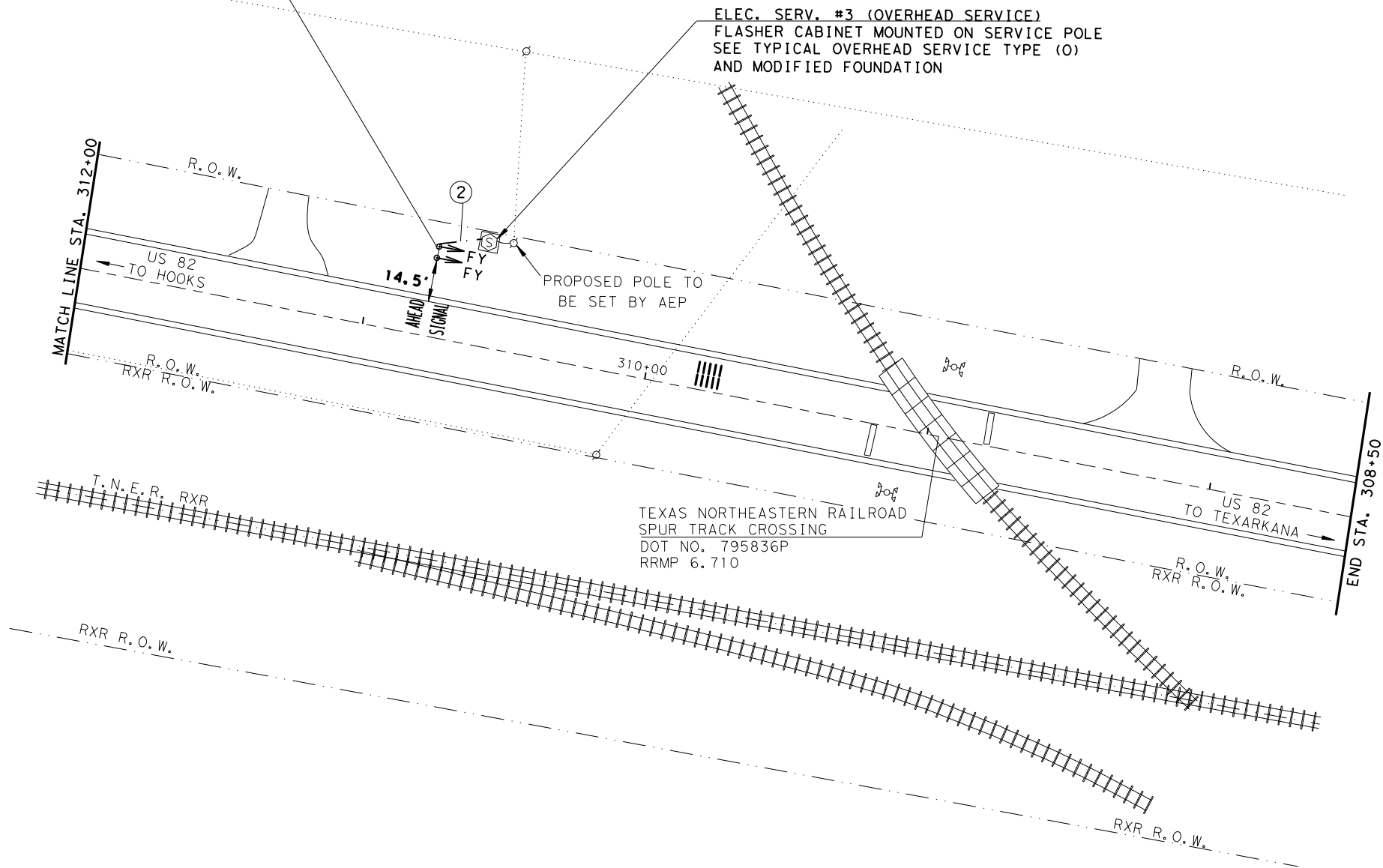
SEE ADVANCE WARNING BEACON AND SIGN TYPICAL DETAILS SHEET



ADVANCE SIGNAL BEACON  
 2 EA FND SCREW-IN TYPE  
 STA. 310+79  
 1066' FROM FM 2148 @  
 EDGE OF SIGNAL ADV.  
 SIGN TO BE 14.5' OFF  
 TRAVEL LANE  
 MINIMUM.

ELEC. SERV. #3 (OVERHEAD SERVICE)  
 FLASHER CABINET MOUNTED ON SERVICE POLE  
 SEE TYPICAL OVERHEAD SERVICE TYPE (O)  
 AND MODIFIED FOUNDATION

WIRE RUN			
ITEM	RUN	2	
WIRE	#6 BARE	1	
	3/C #12	1	
CONDUIT	2" PVC	X	
	RUN LENGTH (FT)	18'	

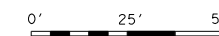


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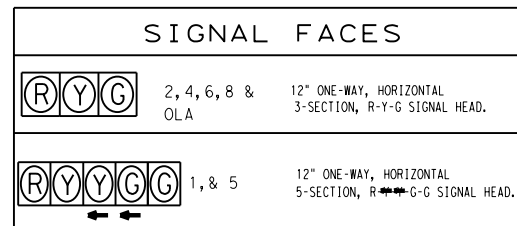
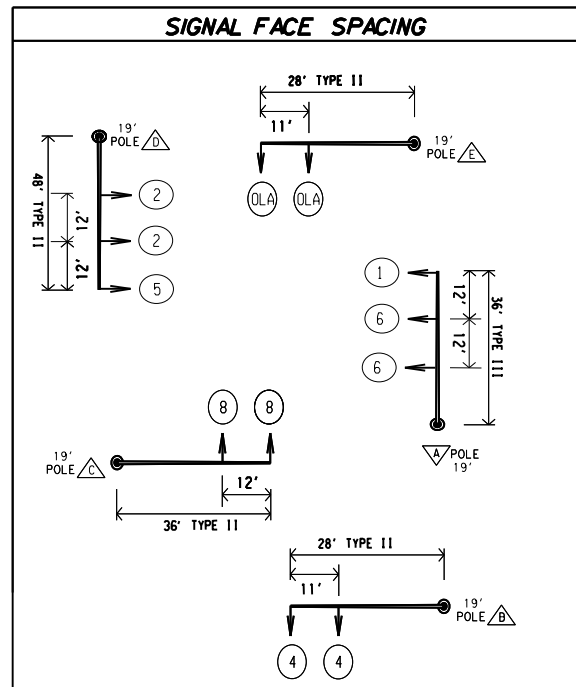
PROPOSED SIGNAL LAYOUT  
 US 82 AT FM 2148

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 SHEET 4 OF 4

FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				31
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	

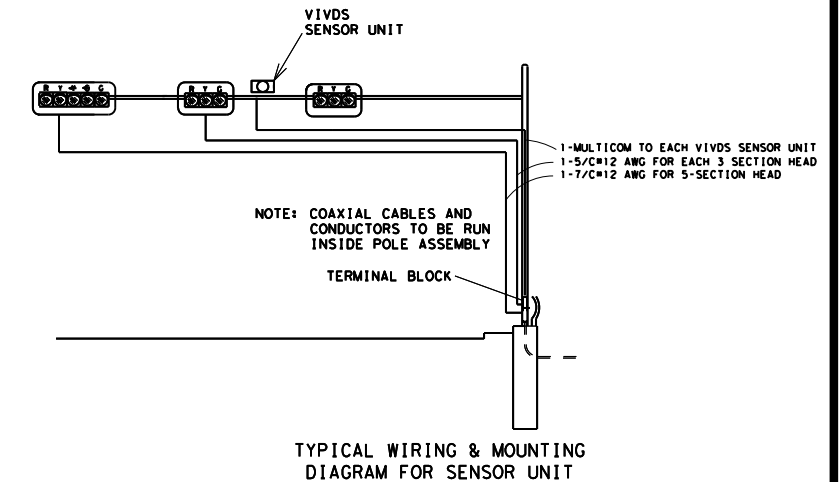


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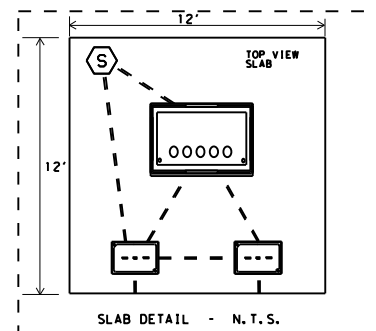
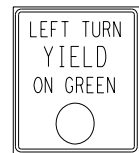


**VIVD SENSOR UNIT DETAIL**

UNIT	SETTING	FUNCTION	DELAY
C1	PRESENCE	CALL & EXTEND 1 & 6	N/A
C2	PRESENCE	CALL & EXTEND 4	5 SEC
C3	PRESENCE	CALL & EXTEND 8	5 SEC
C4	PRESENCE	CALL & EXTEND 2 & 5	N/A
C5	PRESENCE	CALL & EXTEND OLA	5 SEC



S1  
 R10-12  
 30"x36"  
 FURNISH  
 AND  
 INSTALL  
 NEW SIGNS  
 SUBSIDIARY  
 TO ITEM 680  
 2 EA.



**MODIFIED CONTROLLER SLAB DETAIL**

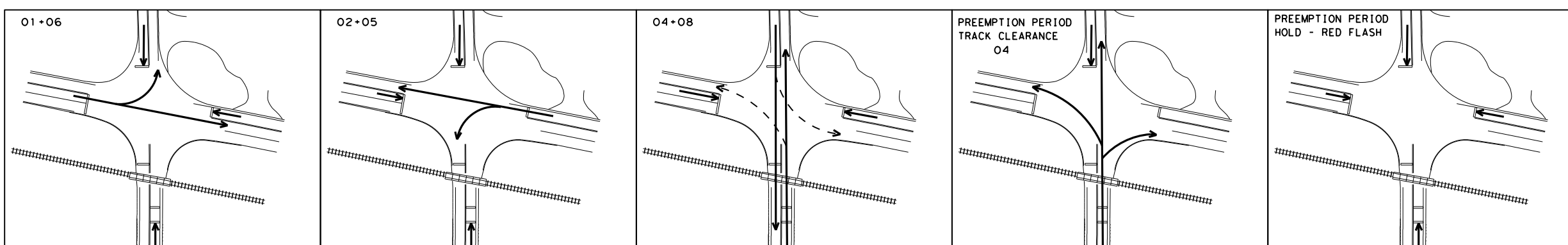
NOTES:  
 1. INCLUDE TWO GROUND BOXES ON CONTROLLER PAD.  
 2. CONDUIT DIRECTIONS ARE FOR DIAGRAMATIC PURPOSES ONLY AND MAY BE ADJUSTED AS SHOWN ON LAYOUTS.

**CONTROLLER FUNCTION**

PHASE	RECALL	MEMORY	PROGRESSION SEQUENCING
1	ON	OFF	N/A
2	ON	OFF	N/A
4	OFF	OFF	N/A
OLA	OFF	OFF	N/A
5	ON	OFF	N/A
6	ON	OFF	N/A
8	OFF	OFF	N/A



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 11/30/2021

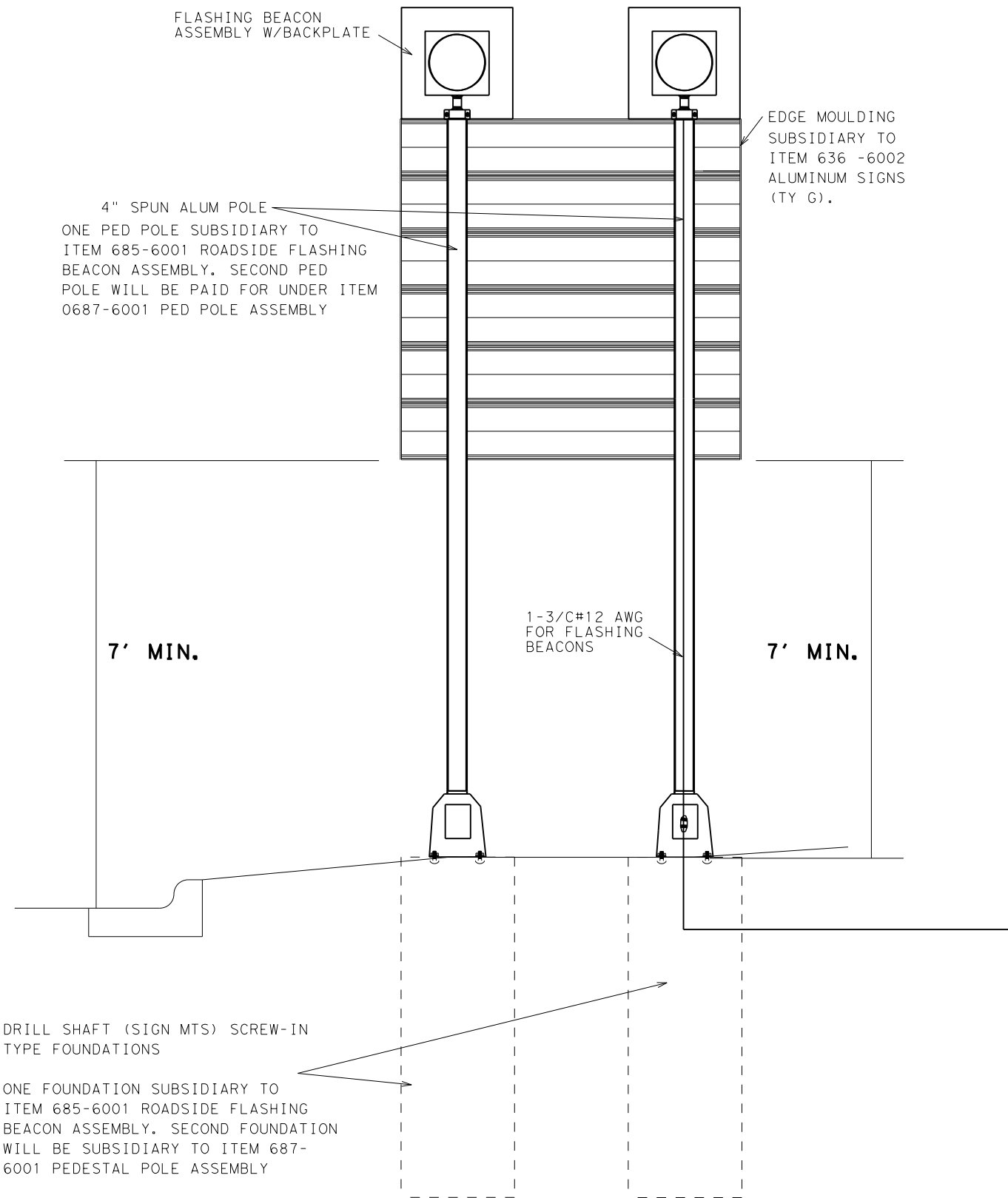


**SIGNAL DETAILS  
 US 82 AT  
 FM 2148**

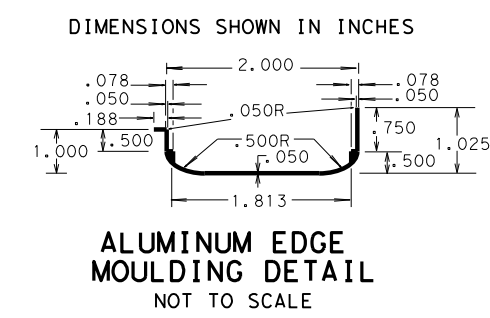
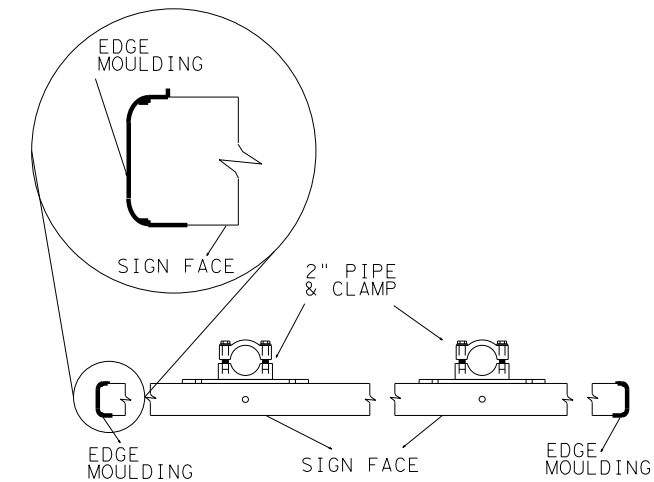
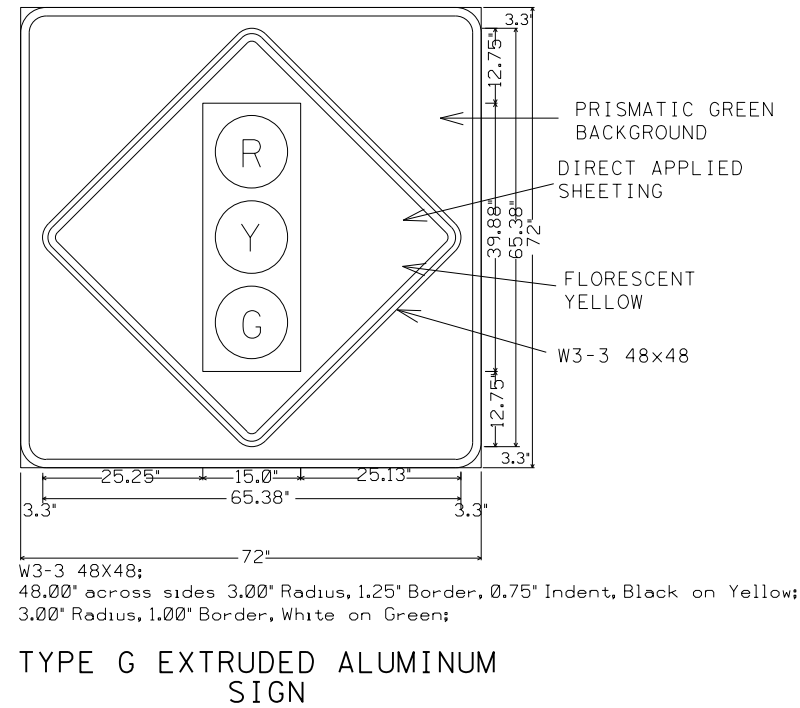
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FHWA TEXAS DIVISION	CONSTRUCTION PROJECT NO.		SHEET NO.
			32
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82

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 DATE: 11/19/2021 7:49:26 AM



**TYPICAL SIGN MOUNTING DETAIL  
 EXTRUDED ALUMINUM SIGN W/EDGE MOULDING**  
 NOT TO SCALE



NOTES:

1. SIGNS TO BE FURNISHED AND INSTALLED BY THE CONTRACTOR. CONTRACTOR TO PROVIDE ALL TOOLS AND INCIDENTALS NEEDED TO MOUNT THE SIGNS.
2. SIGNS WILL BE CONSTRUCTED WITH EXTRUDED ALUMINUM (TY G) MATERIAL WITH ALUMINUM EDGE MOULDING. EDGE MOULDING WILL BE SUBSIDIARY TO ITEM 636-6002 ALUMINUM SIGNS (TY G).
3. FURNISH AND INSTALL ALUMINUM EDGE MOULDING AS SHOWN ON THE ALUMINUM EDGE MOULDING DETAIL.
4. VERIFY ELEVATIONS TO ENSURE MINIMUM 7' CLEARANCE FOR SIGNAL ADVANCE SIGNS.

STATE OF TEXAS  
 CHRISTINA N. TROWLER  
 114588  
 LICENSED PROFESSIONAL ENGINEER  
 Christina N. Trowler, P.E.  
 11/30/2021

**ADVANCE WARNING  
 BEACON AND SIGN  
 TYPICAL DETAILS**



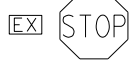












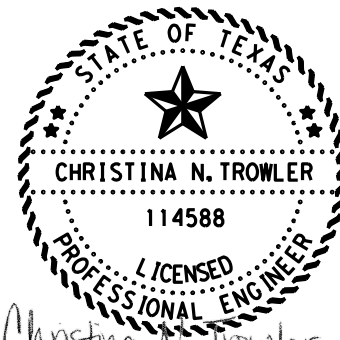
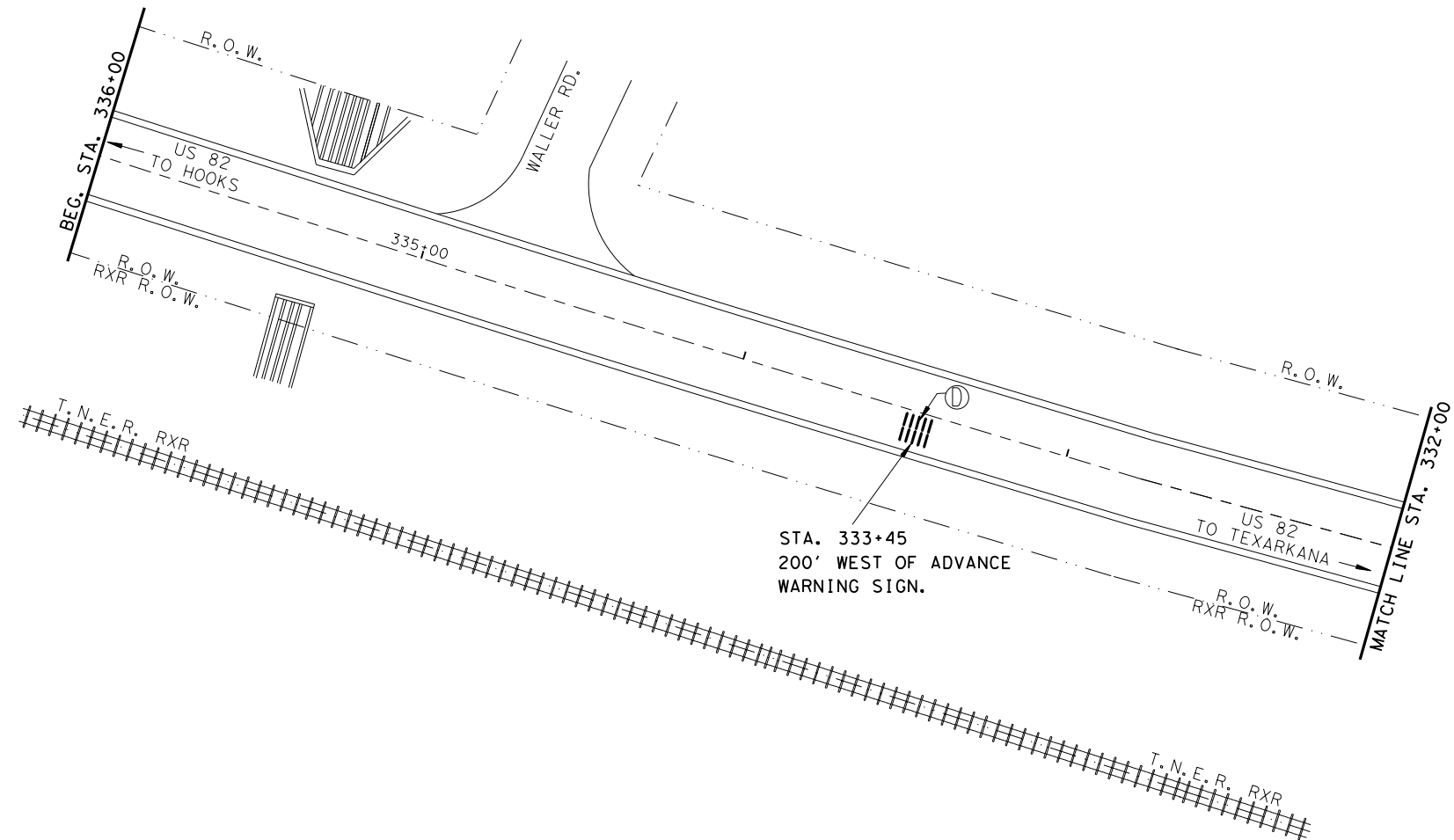
FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				33
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	

FILE: T:\engdata\Traffic\DGN\192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082 US 82 at FM 2148\US 82 at FM 2148 Intersection\US82@FM2148 sign and striping.dgn  
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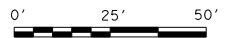


LEGEND

-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXISTING SIGN RELOCATED
-  PROPOSED SIGN AND NUMBER
-  EXISTING SIGN TO BE REMOVED  
TXDOT SALVAGE
-  ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED  
REUSE EXISTING POST
-  RAILROAD SIGNALS
-  (A) PREFAB PAV MRK TY C (W) (24") (SLD)
-  (B) PREFAB PAV MRK TY C (W) (ARROW)
-  (C) PREFAB PAV MRK TY C (W) (WORD)
-  (D) PREFORMED IN-LANE (TRANS)  
RUMBLE STRIP



Christina N. Trowler, P.E.  
 11/30/2021



**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**














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 SHEET 1 OF 9

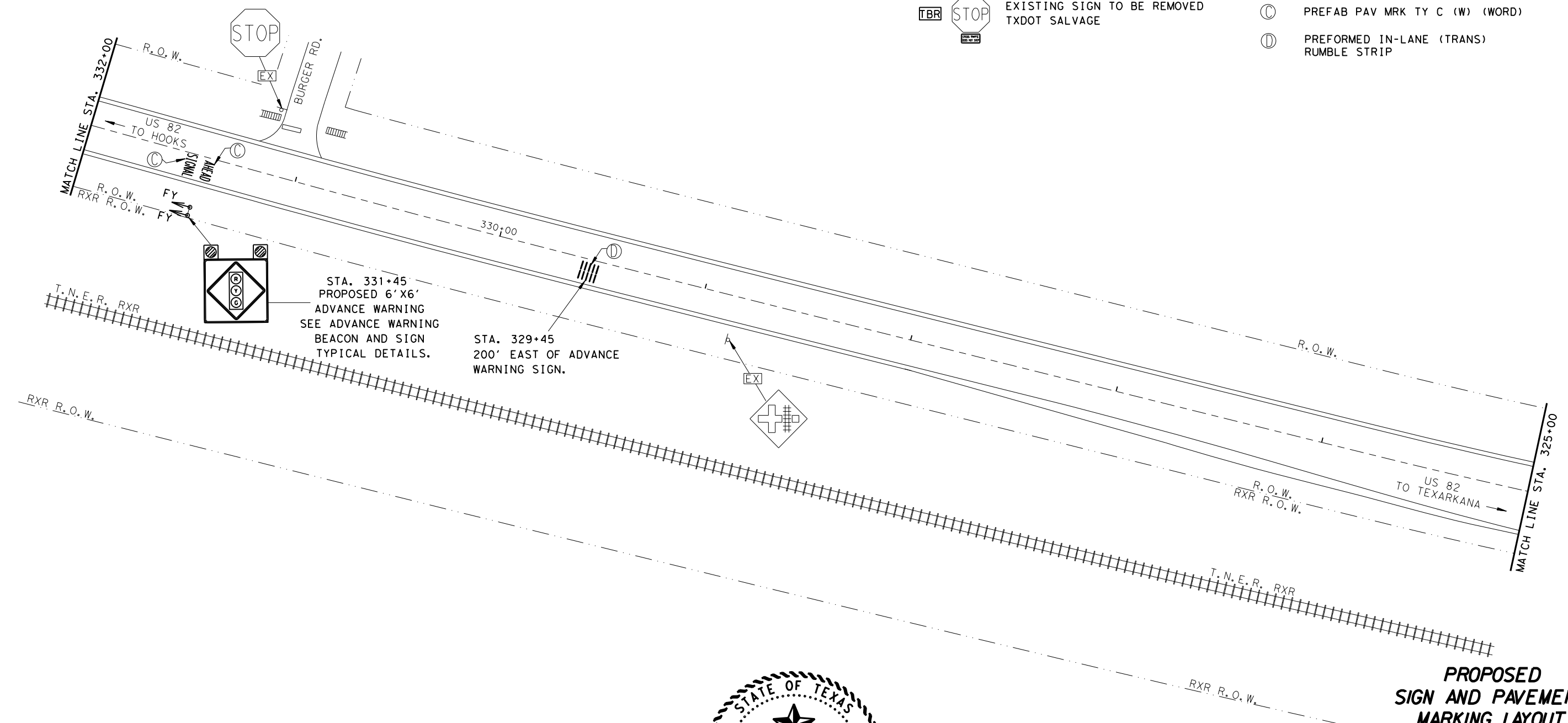
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82

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 DATE: 11/19/2021 8:43:36 AM



LEGEND

-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXISTING SIGN RELOCATED
-  PROPOSED SIGN AND NUMBER
-  EXISTING SIGN TO BE REMOVED TXDOT SALVAGE
-  ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
-  RAILROAD SIGNALS
-  PREFAB PAV MRK TY C(W) (24") (SLD)
-  PREFAB PAV MRK TY C(W) (ARROW)
-  PREFAB PAV MRK TY C(W) (WORD)
-  PREFORMED IN-LANE (TRANS) RUMBLE STRIP



STA. 331+45  
 PROPOSED 6' X 6'  
 ADVANCE WARNING  
 BEACON AND SIGN  
 TYPICAL DETAILS.

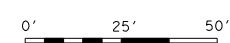
STA. 329+45  
 200' EAST OF ADVANCE  
 WARNING SIGN.



**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**

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 SHEET 2 OF 9

FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				35
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	





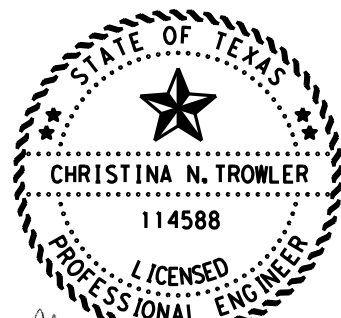
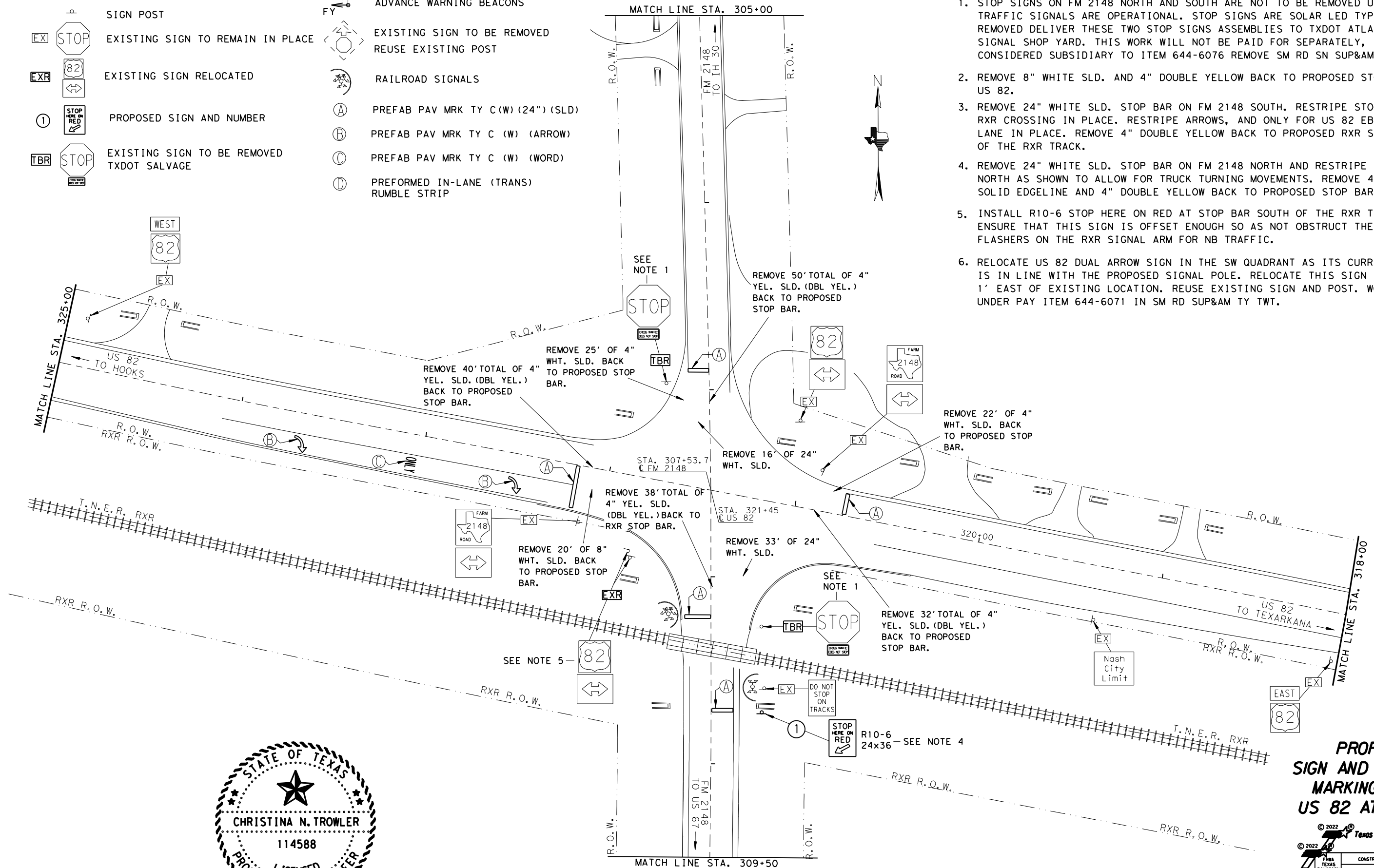
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 DATE: 11/19/2021 8:41:40 AM

LEGEND

- |  |  |  |   |
|--|--|--|---|
|  | CULVERT                                      |  | ADVANCE WARNING BEACONS                   |
|  | SIGN POST                                    |  | EXISTING SIGN TO BE REMOVED               |
|  | EXISTING SIGN TO REMAIN IN PLACE             |  | REUSE EXISTING POST                       |
|  | EXISTING SIGN RELOCATED                      |  | RAILROAD SIGNALS                          |
|  | PROPOSED SIGN AND NUMBER                     |  | PREFAB PAV MRK TY C (W) (SLD)             |
|  | EXISTING SIGN TO BE REMOVED<br>TXDOT SALVAGE |  | PREFAB PAV MRK TY C (W) (ARROW)           |
|  |  |  | PREFAB PAV MRK TY C (W) (WORD)            |
|  |  |  | PREFORMED IN-LANE (TRANS)<br>RUMBLE STRIP |

NOTES

- STOP SIGNS ON FM 2148 NORTH AND SOUTH ARE NOT TO BE REMOVED UNTIL TRAFFIC SIGNALS ARE OPERATIONAL. STOP SIGNS ARE SOLAR LED TYPE. WHEN REMOVED DELIVER THESE TWO STOP SIGNS ASSEMBLIES TO TXDOT ATLANTA DISTRICT SIGNAL SHOP YARD. THIS WORK WILL NOT BE PAID FOR SEPARATELY, BUT WILL BE CONSIDERED SUBSIDIARY TO ITEM 644-6076 REMOVE SM RD SN SUP&AM.
- REMOVE 8" WHITE SLD. AND 4" DOUBLE YELLOW BACK TO PROPOSED STOP BARS ON US 82.
- REMOVE 24" WHITE SLD. STOP BAR ON FM 2148 SOUTH. RESTRIPE STOP BARS FOR RXR CROSSING IN PLACE. RESTRIPE ARROWS, AND ONLY FOR US 82 EB RIGHT TURN LANE IN PLACE. REMOVE 4" DOUBLE YELLOW BACK TO PROPOSED RXR STOP BAR NORTH OF THE RXR TRACK.
- REMOVE 24" WHITE SLD. STOP BAR ON FM 2148 NORTH AND RESTRIPE BACK TO THE NORTH AS SHOWN TO ALLOW FOR TRUCK TURNING MOVEMENTS. REMOVE 4" WHITE SOLID EDGELINE AND 4" DOUBLE YELLOW BACK TO PROPOSED STOP BAR.
- INSTALL R10-6 STOP HERE ON RED AT STOP BAR SOUTH OF THE RXR TRACK. ENSURE THAT THIS SIGN IS OFFSET ENOUGH SO AS NOT OBSTRUCT THE VIEW OF THE FLASHERS ON THE RXR SIGNAL ARM FOR NB TRAFFIC.
- RELOCATE US 82 DUAL ARROW SIGN IN THE SW QUADRANT AS ITS CURRENT LOCATION IS IN LINE WITH THE PROPOSED SIGNAL POLE. RELOCATE THIS SIGN 3' SOUTH AND 1' EAST OF EXISTING LOCATION. REUSE EXISTING SIGN AND POST. WORK WILL BE UNDER PAY ITEM 644-6071 IN SM RD SUP&AM TY TWT.

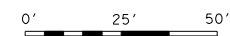


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 11/30/2021

PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148

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 SHEET 3 OF 9














STATE	DISTRICT	COUNTY
TEXAS	ATL	BOWIE
CONTROL	SECTION	JOB
0046	06	082
		HIGHWAY NO.
		US 82

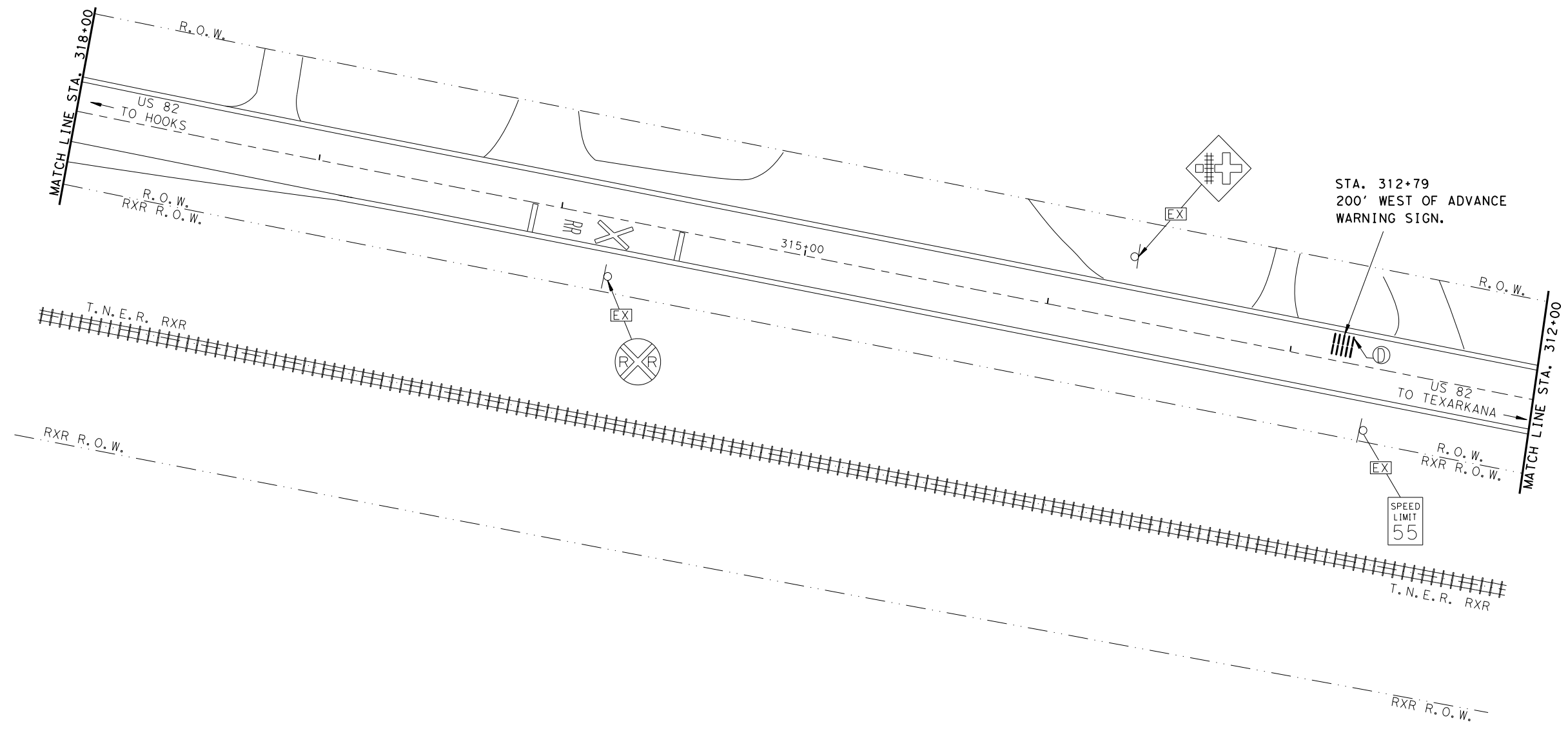


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 DATE: 11/19/2021 8:46:08 AM



LEGEND

-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXR EXISTING SIGN RELOCATED
-  ① PROPOSED SIGN AND NUMBER
-  TBR EXISTING SIGN TO BE REMOVED TXDOT SALVAGE
-  FY ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
-  RAILROAD SIGNALS
-  (A) PREFAB PAV MRK TY C(W) (24") (SLD)
-  (B) PREFAB PAV MRK TY C(W) (ARROW)
-  (C) PREFAB PAV MRK TY C(W) (WORD)
-  (D) PREFORMED IN-LANE (TRANS) RUMBLE STRIP

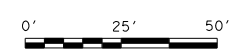


Christina N. Trowler, P.E.  
 11/30/2021

**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**



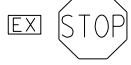










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 SHEET 4 OF 9

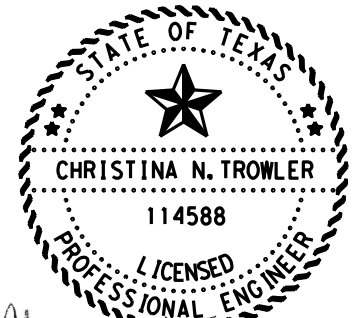
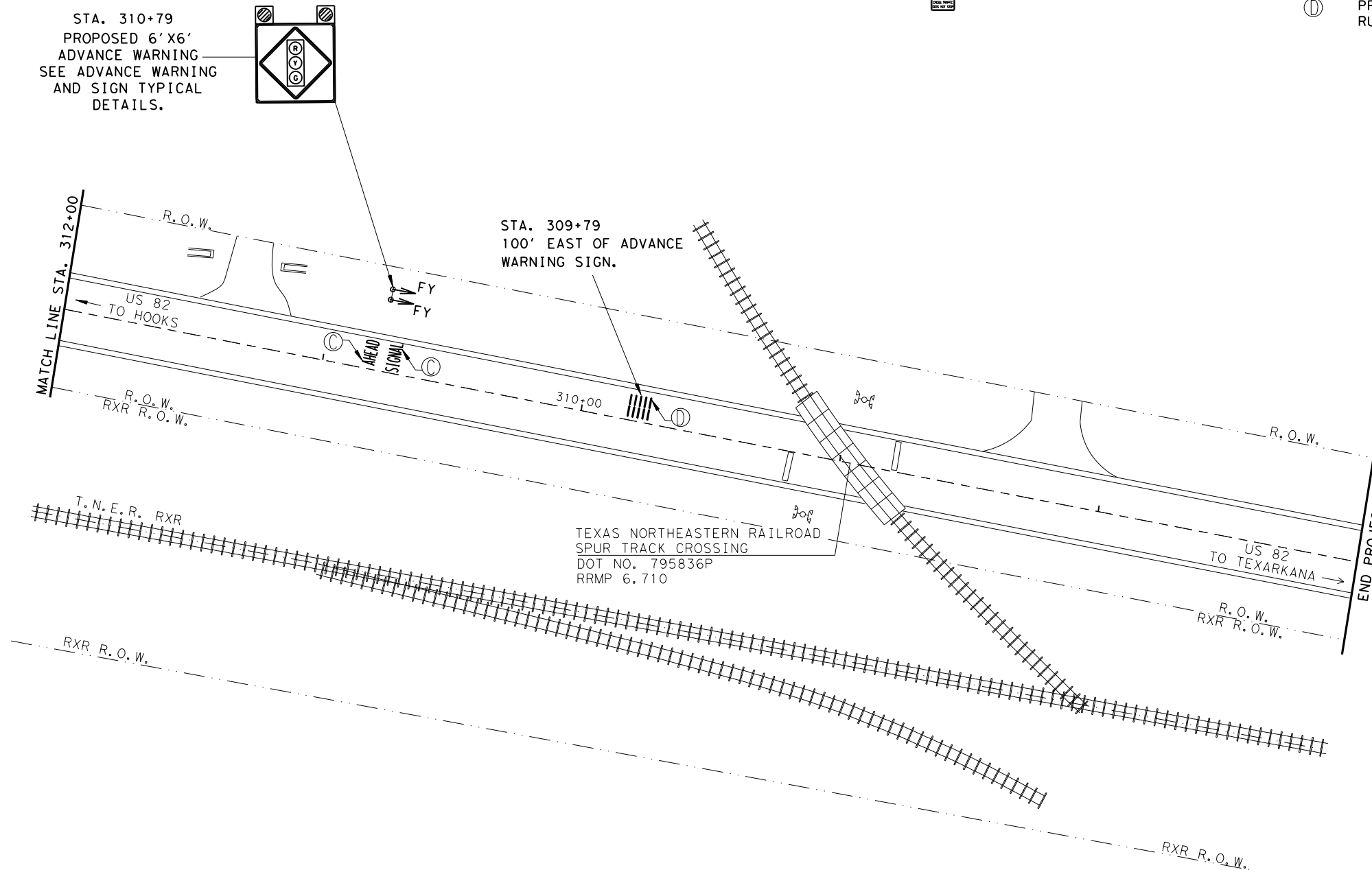
FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				37
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



FILE: T:\engdata\Traffic\DGN\192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082 US 82 at FM 2148 Intersection\US82@FM2148 sign and striping.dgn  
 DATE: 11/19/2021 8:46:46 AM

LEGEND

-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXISTING SIGN RELOCATED
-  PROPOSED SIGN AND NUMBER
-  EXISTING SIGN TO BE REMOVED TXDOT SALVAGE
-  ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
-  RAILROAD SIGNALS
-  PREFAB PAV MRK TY C(W) (24") (SLD)
-  PREFAB PAV MRK TY C (W) (ARROW)
-  PREFAB PAV MRK TY C (W) (WORD)
-  PREFORMED IN-LANE (TRANS) RUMBLE STRIP



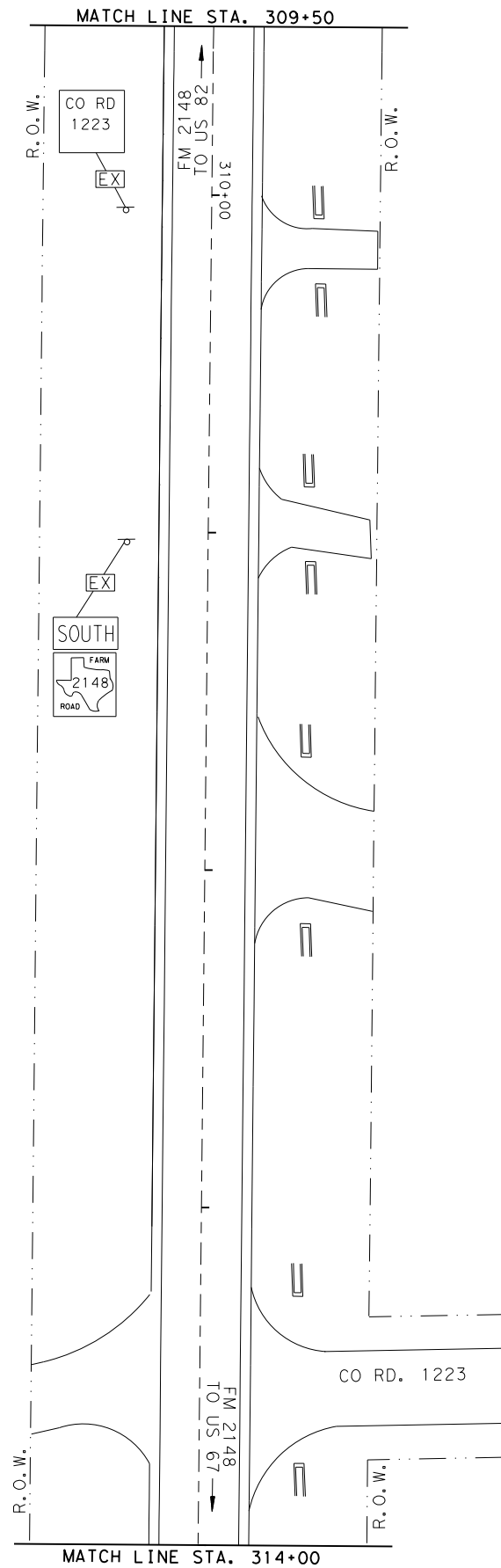
Christina N. Trowler, P.E.  
 11/30/2021

**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**














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 SHEET 5 OF 9

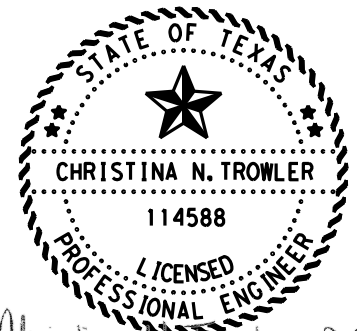
FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				38
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	





LEGEND

-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXR EXISTING SIGN RELOCATED
-  ① PROPOSED SIGN AND NUMBER
-  TBR EXISTING SIGN TO BE REMOVED TXDOT SALVAGE
-  FY ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
-  RAILROAD SIGNALS
-  (A) PREFAB PAV MRK TY C(W) (24") (SLD)
-  (B) PREFAB PAV MRK TY C(W) (ARROW)
-  (C) PREFAB PAV MRK TY C(W) (WORD)
-  (D) PREFORMED IN-LANE (TRANS) RUMBLE STRIP

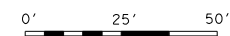


Christina N. Trowler, P.E.  
 11/30/2021

**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**







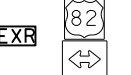






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 SHEET 6 OF 9

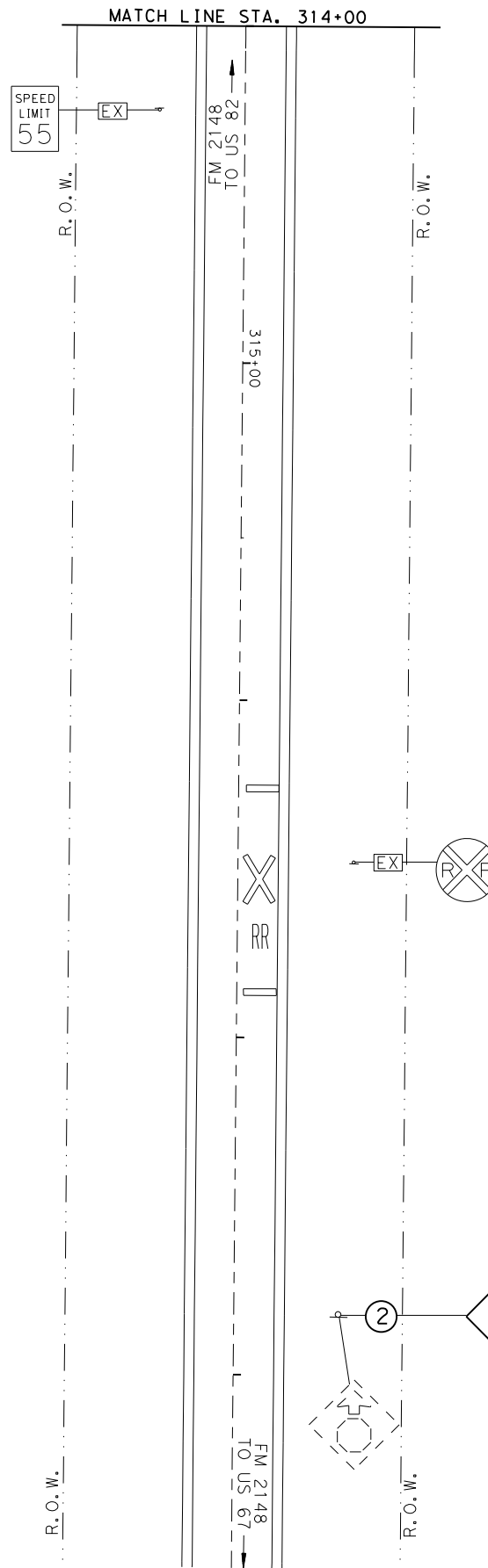
FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				39
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



FILE: T:\engdata\Traffic\DGN\192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082\_US 82 at FM 2148\US 82 at FM 2148\US 82 at FM 2148 Intersection\US82@FM2148 sign and striping.dgn  
 DATE: 11/19/2021 8:48:13 AM

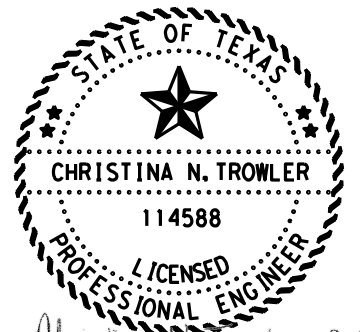
LEGEND

- |   |  |  |  |
|---|--|--|--|
|  | CULVERT                                      |                           | ADVANCE WARNING BEACONS                            |
|  | SIGN POST                                    |                           | EXISTING SIGN TO BE REMOVED<br>REUSE EXISTING POST |
|  | EXISTING SIGN TO REMAIN IN PLACE             |                           | RAILROAD SIGNALS                                   |
|  | EXISTING SIGN RELOCATED                      |  | PREFAB PAV MRK TY C (W) (24") (SLD)                |
|  | PROPOSED SIGN AND NUMBER                     |                           | PREFAB PAV MRK TY C (W) (ARROW)                    |
|  | EXISTING SIGN TO BE REMOVED<br>TXDOT SALVAGE |                           | PREFAB PAV MRK TY C (W) (WORD)                     |
|   |  |                           | PREFAB PAV MRK TY C (W) (RUMBLE STRIP)             |



NOTES

1. REPLACE EXISTING STOP AHEAD SIGN WITH SIGNAL AHEAD SIGN W3-3 36"x36". THE EXISTING STOP AHEAD SIGN IS 36"x36", SO EXISTING SIGN POST WILL REMAIN AND JUST CHANGE OUT THE SIGN. THIS WORK WILL BE PAID FOR UNDER ITEM 0636-6007 REPLACE EXISTING ALUMINUM SIGNS (TY A).
2. THIS SIGN TO BE REPLACED AT THE TIME OF THE SIGNAL ACTIVATION AND NOT BEFORE.

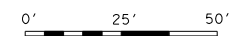


Christina N. Trowler, P.E.  
 11/30/2021

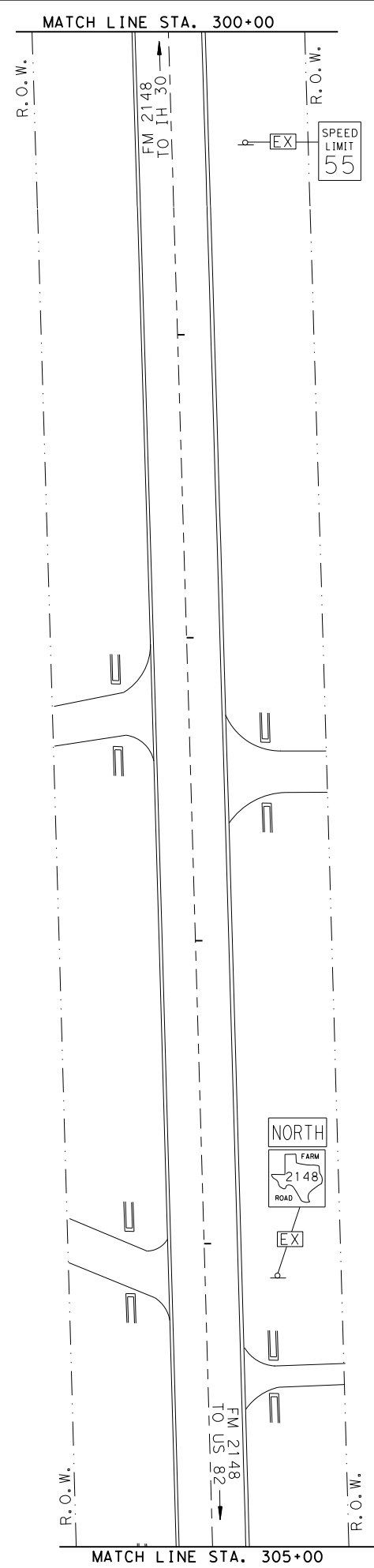
**PROPOSED  
 SIGN AND PAVEMENT  
 MARKING LAYOUT  
 US 82 AT FM 2148**

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 SHEET 7 OF 9



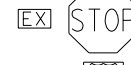
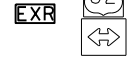
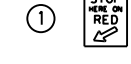








STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



FILE: T:\engdata\Traffic\DN\192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082\_US 82 at FM 2148\US 82 at FM 2148\US 82 at FM 2148 Intersection\US82@FM2148 sign and striping.dgn  
 DATE: 11/19/2021 8:51:26 AM



LEGEND

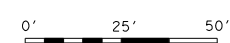
-  CULVERT
-  SIGN POST
-  EXISTING SIGN TO REMAIN IN PLACE
-  EXR EXISTING SIGN RELOCATED
-  ① PROPOSED SIGN AND NUMBER
-  TBR EXISTING SIGN TO BE REMOVED TXDOT SALVAGE
-  FY ADVANCE WARNING BEACONS
-  EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
-  RAILROAD SIGNALS
-  (A) PREFAB PAV MRK TY C(W) (24") (SLD)
-  (B) PREFAB PAV MRK TY C(W) (ARROW)
-  (C) PREFAB PAV MRK TY C(W) (WORD)
-  (D) PREFORMED IN-LANE (TRANS) RUMBLE STRIP

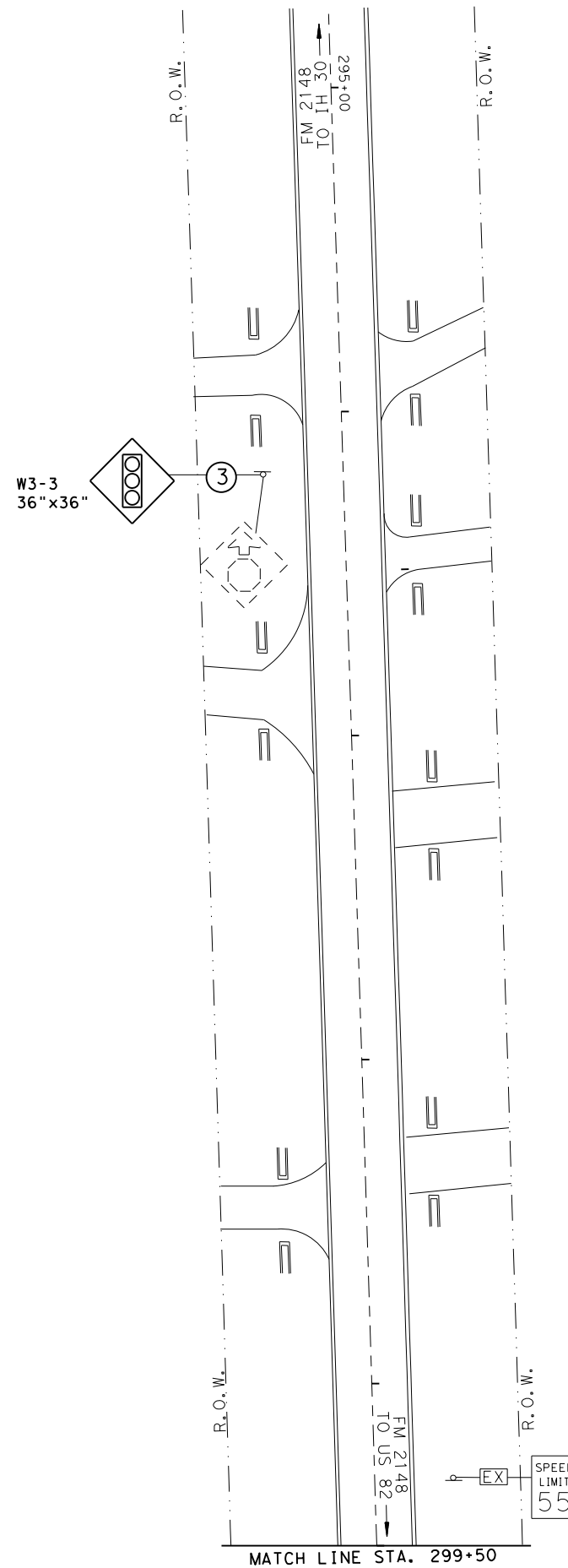
  
 CHRISTINA N. TROWLER  
 114588  
 LICENSED PROFESSIONAL ENGINEER  
*Christina N. Trowler, P.E.*  
 11/30/2021

**PROPOSED  
SIGN AND PAVEMENT  
MARKING LAYOUT  
US 82 AT FM 2148**

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SHEET 8 OF 9

FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				41
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	





LEGEND

- CULVERT
- SIGN POST
- EXISTING SIGN TO REMAIN IN PLACE
- EXR 82
- 1 STOP AHEAD
- TBR STOP
- FY FY
- EXISTING SIGN TO BE REMOVED REUSE EXISTING POST
- RAILROAD SIGNALS
- (A)
- (B)
- (C)
- (D)

NOTES

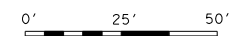
1. REPLACE EXISTING STOP AHEAD SIGN WITH SIGNAL AHEAD SIGN W3-3 36"x36". THE EXISTING STOP AHEAD SIGN IS 36"x36", SO EXISTING SIGN POST WILL REMAIN AND JUST CHANGE OUT THE SIGN. THIS WORK WILL BE PAID FOR UNDER ITEM 0636-6007 REPLACE EXISTING ALUMINUM SIGNS (TY A).
2. THIS SIGN TO BE REPLACED AT THE TIME OF THE SIGNAL ACTIVATION AND NOT BEFORE.

Christina N. Trowler, P.E.  
 11/30/2021

**PROPOSED  
SIGN AND PAVEMENT  
MARKING LAYOUT  
US 82 AT FM 2148**

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SHEET 9 OF 9

FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				42
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



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 DATE: 11/19/2021 08:19 AM

ELECTRICAL SERVICE DATA

ELECT SERV. NO.	LOCATION	ELECTRICAL SERVICE DESCRIPTION SEE ED (5)-14	SERVICE CONDUIT SIZE	SERVICE CONDUCTOR NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR POLE/AMP	TWO-POLE CONTACTOR AMPS	PANELBD/LOADCENTER AMP RATING (MIN)	CIRCUIT	BRANCH CKT. BKR. POLE/AMPS	KVA LOAD
1	US 82 AT FM 2148 EB ADV. WARNING	ELC SRV TY T 120/240 000 (NS) GS (N) SP (O)	2"	3/*6	N/A	N/A	N/A	70	ADV. WARN.	1P/15A	0.2
2	US 82 AT FM 2148 SIGNAL/ILLUM.	ELC SRV TY D 120/240 070 (NS) AL (E) PS (U)	2"	3/*4	N/A	2P/70	N/A	100	TRF. SIG. LUM.	1P/60A 2P/15A	6.6
3	US 82 AT FM 2148 WB ADV. WARNING	ELC SRV TY T 120/240 000 (NS) GS (N) SP (O)	2"	3/*6	N/A	N/A	N/A	70	ADV. WARN.	1P/15A	0.2



*Christina N. Trowler, P.E.*  
 11/30/2021

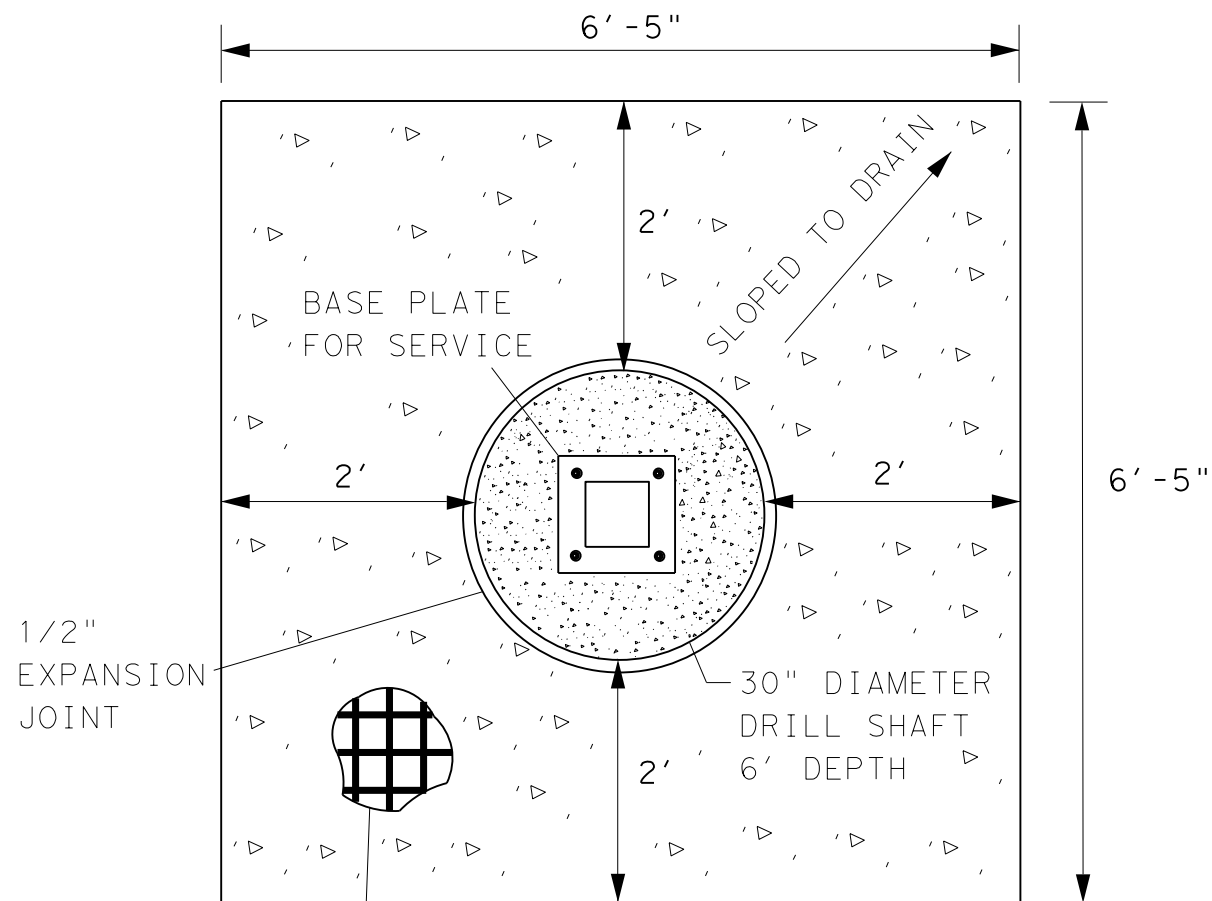
**ELECTRICAL  
 SERVICE DATA**



FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				43
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



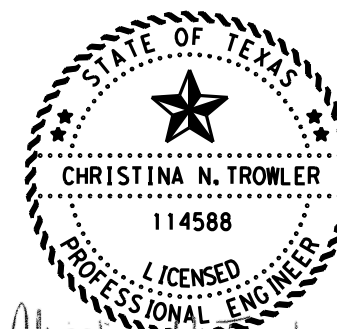
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 DATE: 11/19/2021 9:12:26 AM



4" RIPRAP (CONC) (CL B)  
 WITH 6"X6"  
 (W2.9 X W2.9)  
 WELDED WIRE FABRIC  
 REINFORCEMENT  
 (0.45 CY)

NOTES:

- 1.) PLACE CONCRETE RIPRAP APRON AROUND 30" DRILL SHAFT FOR ELECTRICAL SERVICE AS SHOWN IN THE DETAIL WITH A 4" DEPTH.
- 2.) USE 6"X6" W2.9 X W2.9 WELDED WIRE FABRIC FOR REINFORCEMENT.
- 3.) RIP RAP APRON WILL BE PAID FOR UNDER ITEM 432. DRILL SHAFT FOR ELECTRICAL SERVICE IS SUBSIDIARY TO ITEM 628 AND WILL NOT BE PAID FOR SEPERATELY. DRILL SHAFT DEPTH WILL BE 6'.
- 4.) RIP RAP APRON WILL BE LEVEL WITH FIELD GRADE, BUT IS INTENDED TO DRAIN 1.5% MIN.
- 5.) PROVIDE EXPANSION JOINT BETWEEN THE 30" DRILL SHAFT AND THE RIP RAP APRON.

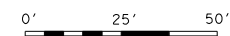


*Christina N. Trowler, P.E.*  
 11/30/2021

**TYPICAL  
 OVERHEAD  
 SERVICE TYPE (O)  
 AND MODIFIED  
 FOUNDATION**



FHWA TEXAS DIVISION		CONSTRUCTION PROJECT NO.		SHEET NO.
				44
STATE	DISTRICT	COUNTY		
TEXAS	ATL	BOWIE		
CONTROL	SECTION	JOB	HIGHWAY NO.	
0046	06	082	US 82	



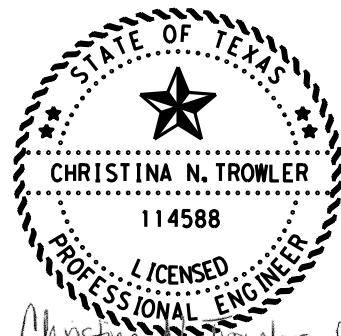
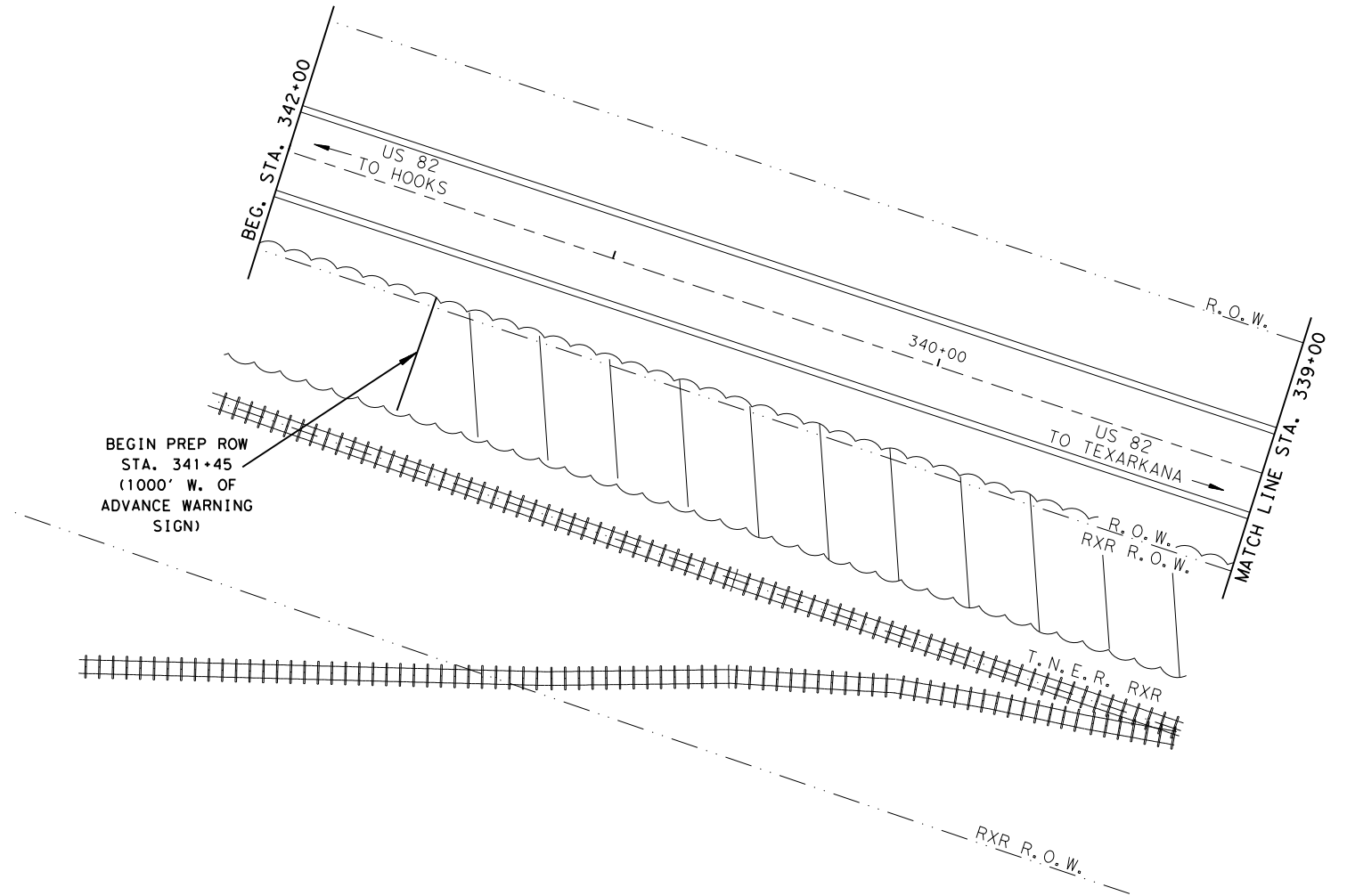
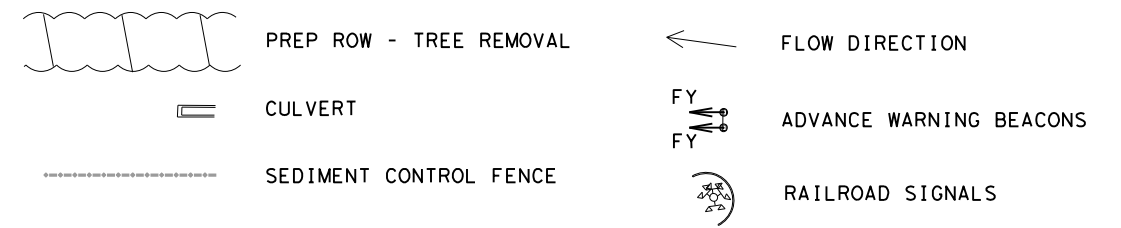
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 DATE: 11/30/2021 11:51:43 AM



SUMMARY OF QUANTITIES  
 SHEET 1 OF 4

ITEM	DESC CODE	DESCRIPTION	UNIT	TOTAL
0100	6001	PREPARING ROW	AC	0.150
0164	6054	BONDED FBR MTRX SEED (PERM) (RURAL) (SAND)	SY	484

LEGEND

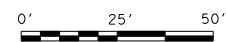


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 11/30/2021

**PROPOSED  
 TREE REMOVAL  
 AND EROSION CONTROL  
 US 82 AT FM 2148**

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 SHEET 1 OF 4







STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



FILE: T:\engdata\Traffic\DN\192515 Jamie\JOBS\SAFETY PROJECTS\CSJ 0046-06-082 US 82 at FM 2148\US 82 at FM 2148 tree trimming.dgn  
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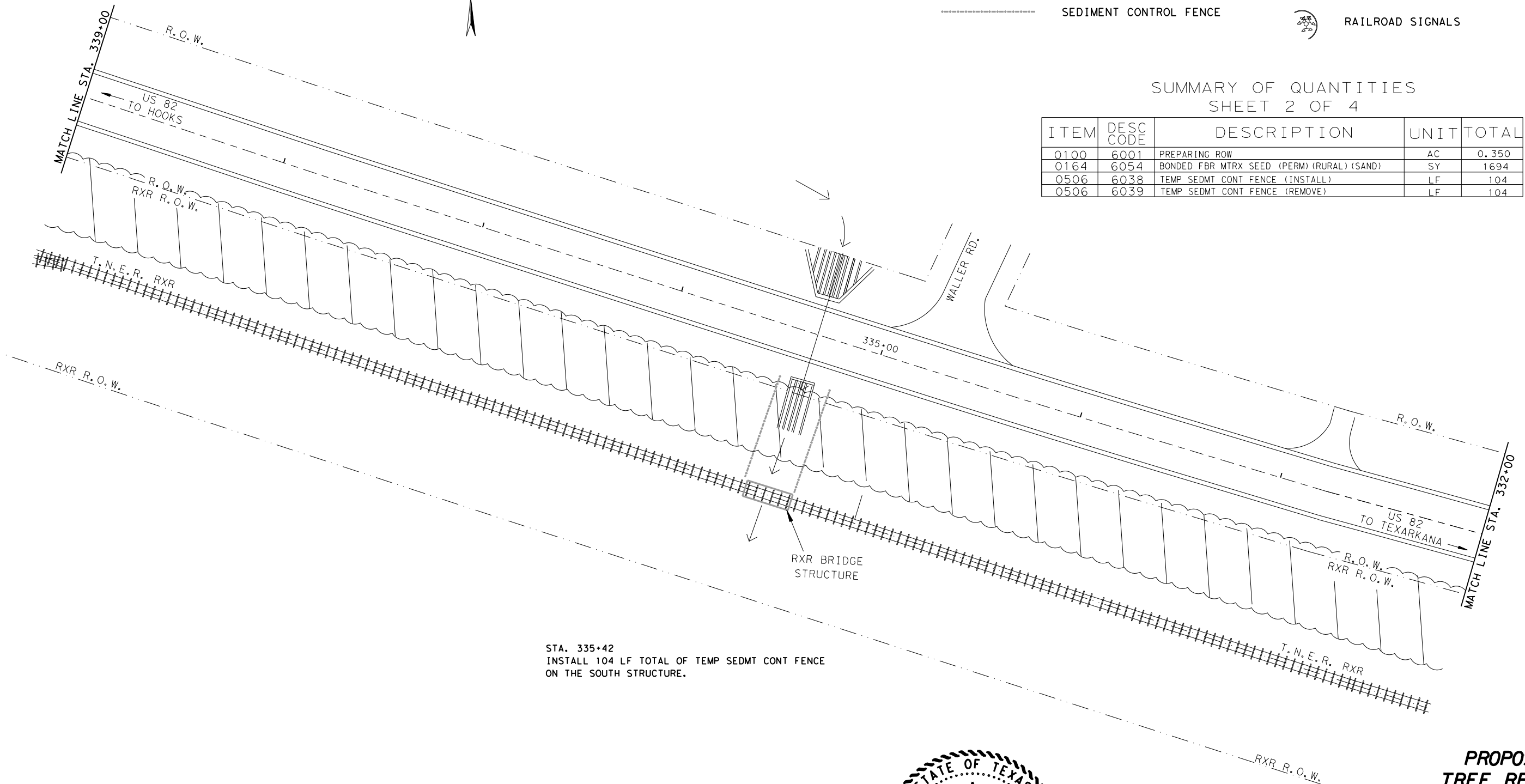


LEGEND

-  PREP ROW - TREE REMOVAL
-  FLOW DIRECTION
-  CULVERT
-  ADVANCE WARNING BEACONS
-  SEDIMENT CONTROL FENCE
-  RAILROAD SIGNALS

SUMMARY OF QUANTITIES  
 SHEET 2 OF 4

ITEM	DESC CODE	DESCRIPTION	UNIT	TOTAL
0100	6001	PREPARING ROW	AC	0.350
0164	6054	BONDED FBR MTRX SEED (PERM) (RURAL) (SAND)	SY	1694
0506	6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	104
0506	6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	104



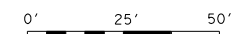
STA. 335+42  
 INSTALL 104 LF TOTAL OF TEMP SEDMT CONT FENCE  
 ON THE SOUTH STRUCTURE.



**PROPOSED  
 TREE REMOVAL  
 AND EROSION CONTROL  
 US 82 AT FM 2148**

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 SHEET 2 OF 4

FHWA TEXAS DIVISION	CONSTRUCTION PROJECT NO.		SHEET NO.
			46
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



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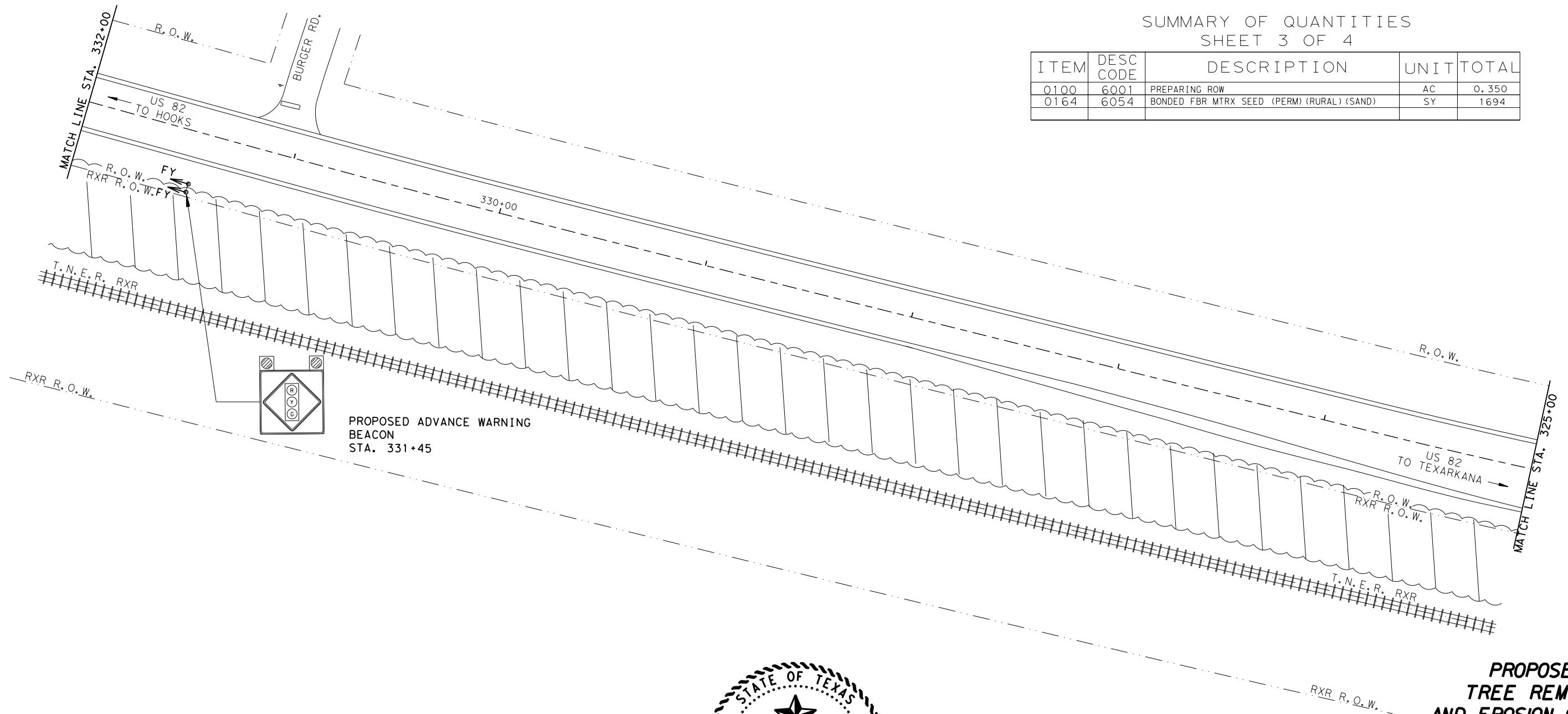


LEGEND

- PREP ROW - TREE REMOVAL
- FLOW DIRECTION
- CULVERT
- ADVANCE WARNING BEACONS
- SEDIMENT CONTROL FENCE
- RAILROAD SIGNALS

SUMMARY OF QUANTITIES  
SHEET 3 OF 4

ITEM	DESC CODE	DESCRIPTION	UNIT	TOTAL
0100	6001	PREPARING ROW	AC	0.350
0164	6054	BONDED FBR MTRX SEED (PERM) (RURAL) (SAND)	SY	1694

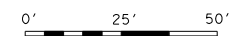


*Christina N. Trowler, P.E.*  
11/30/2021

**PROPOSED  
TREE REMOVAL  
AND EROSION CONTROL  
US 82 AT FM 2148**

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SHEET 3 OF 4

STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



FILE: T:\engdata\Traffic\DN\d192515\_Jamie\JOBS\SAFETY PROJECTS\CSJ\_0046-06-082 US 82 at FM 2148 Intersection\US82@FM2148 tree trimming.dgn  
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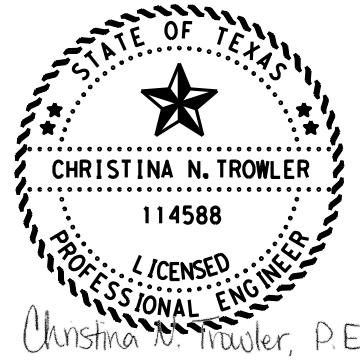
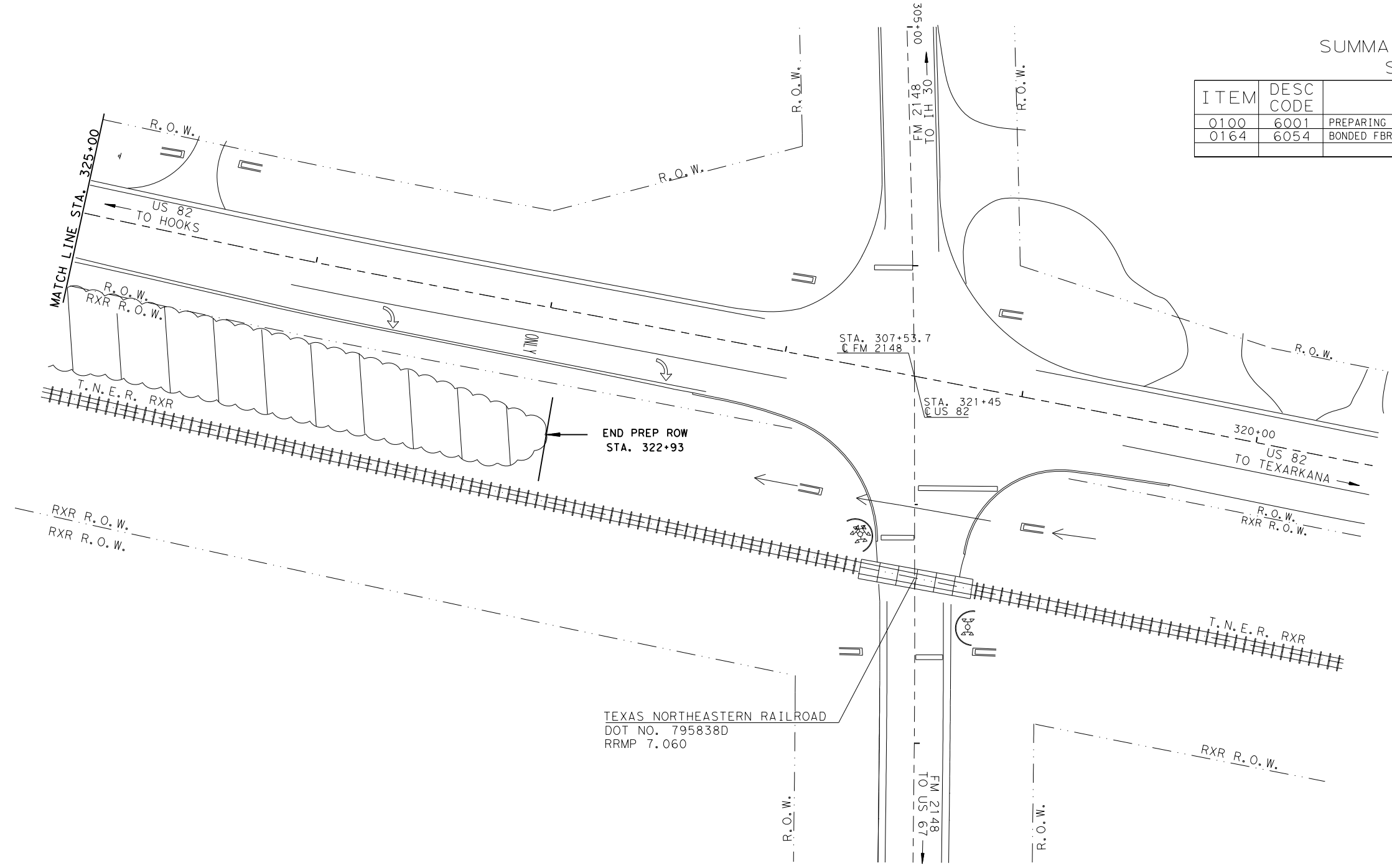


LEGEND

- PREP ROW - TREE REMOVAL
- FLOW DIRECTION
- CULVERT
- ADVANCE WARNING BEACONS
- SEDIMENT CONTROL FENCE
- RAILROAD SIGNALS

SUMMARY OF QUANTITIES  
SHEET 4 OF 4

ITEM	DESC CODE	DESCRIPTION	UNIT	TOTAL
0100	6001	PREPARING ROW	AC	0.150
0164	6054	BONDED FBR MTRX SEED (PERM) (RURAL) (SAND)	SY	484

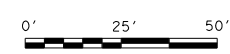


Christina N. Trowler, P.E.  
11/30/2021

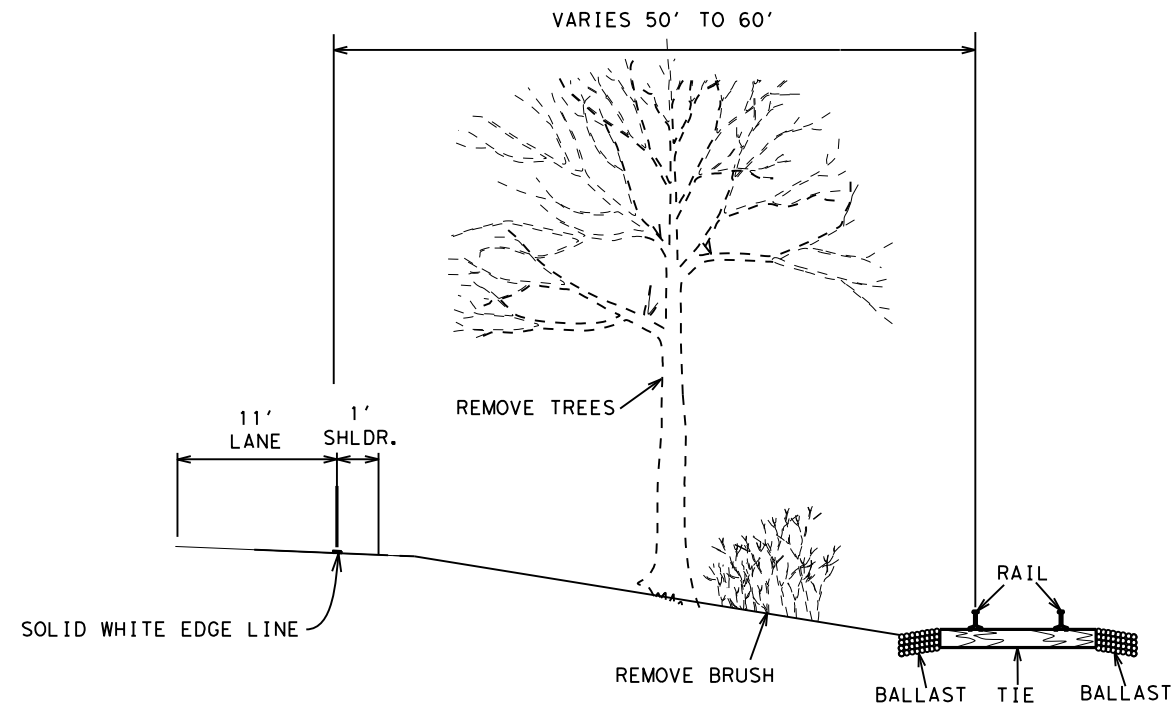
**PROPOSED  
TREE REMOVAL  
AND EROSION CONTROL  
US 82 AT FM 2148**

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SHEET 4 OF 4

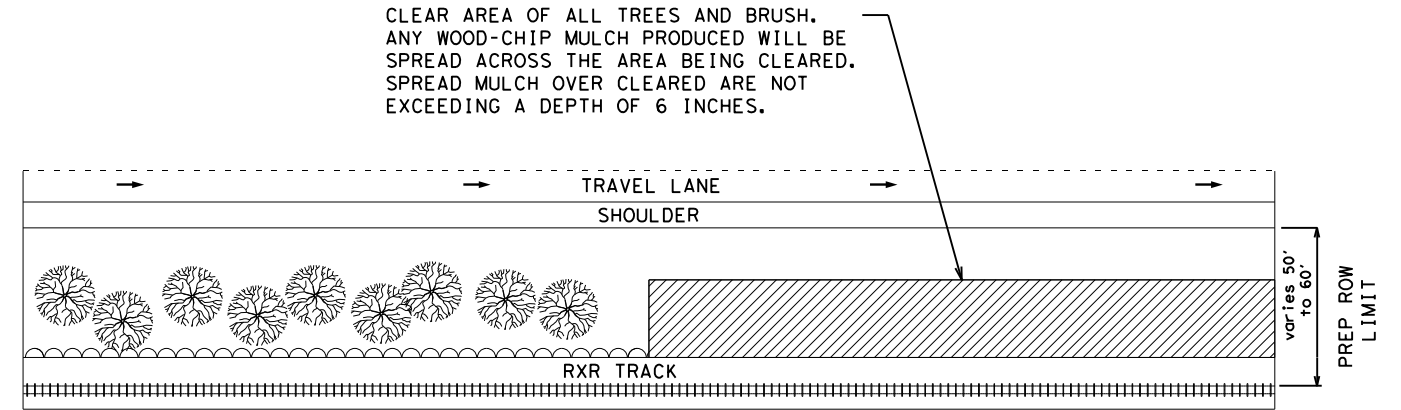
FHWA TEXAS DIVISION	CONSTRUCTION PROJECT NO.	SHEET NO.	48
STATE	DISTRICT	COUNTY	
TEXAS	ATL	BOWIE	
CONTROL	SECTION	JOB	HIGHWAY NO.
0046	06	082	US 82



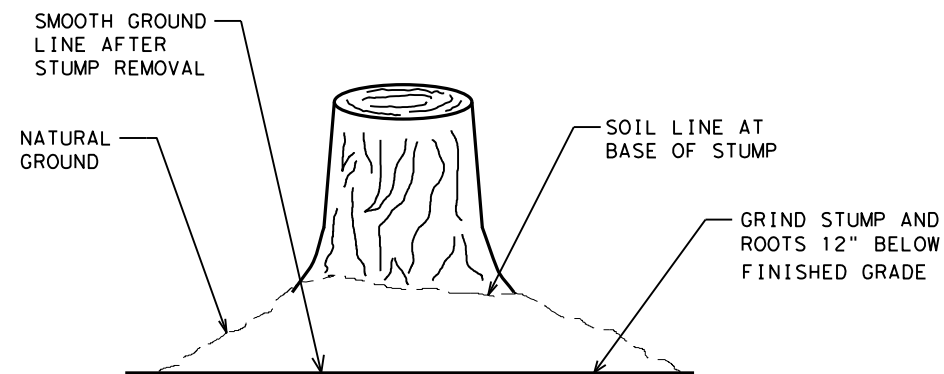
THE INTENT IS TO REMOVE ALL TREES AND BRUSH BETWEEN NEAR RAIL AND EDGE OF TRAVEL LANE.



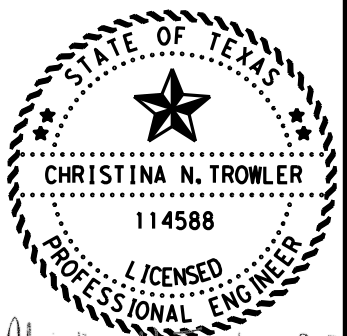
TYPICAL REMOVAL DETAIL



PREP ROW DETAIL



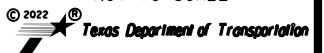
STUMP GRINDING DETAIL



Christina N. Trowler, P.E.  
11/30/2021

**TREE REMOVAL  
DETAILS**

NOT TO SCALE



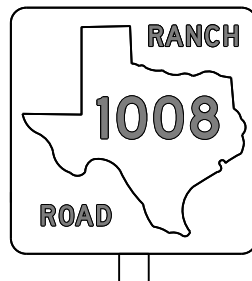
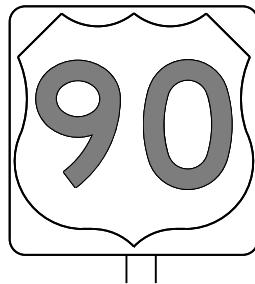
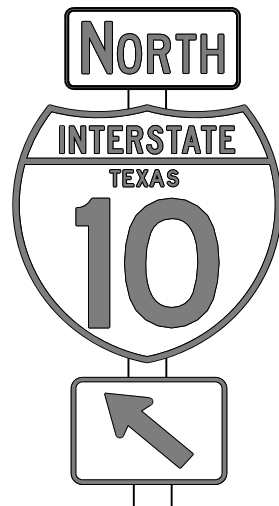
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.	SHEET NO.
		49
STATE	DISTRICT	COUNTY
TEXAS	ATL	BOWIE
CONTROL	SECTION	JOB
0046	06	082
		HIGHWAY NO.
		US 82

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DATE: 9/16/2021 3:17:29 PM  
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## REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

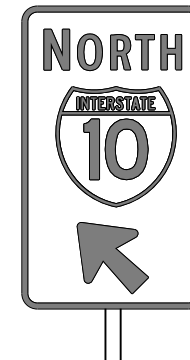
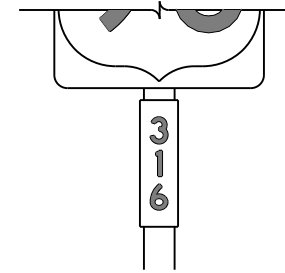
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

## REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

## GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

- Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
- Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.

<http://www.txdot.gov/>



## TYPICAL SIGN REQUIREMENTS

### TSR(3) - 13

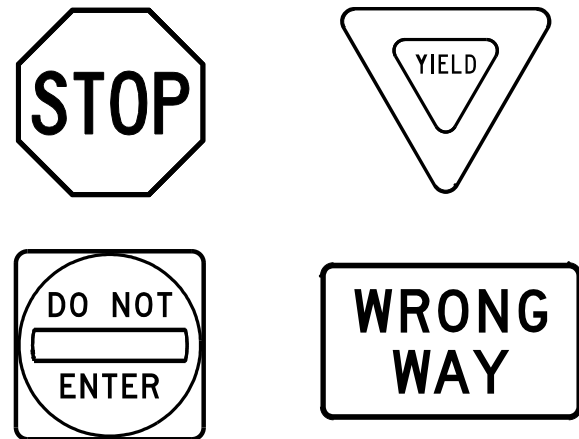
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©TxDOT	October 2003	CONT	SECT	JOB	HIGHWAY				
REVISIONS		0046	06	082	US 82				
12-03	7-13	DIST	COUNTY	SHEET NO.					
9-08		ATL	BOWIE	50					



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### REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

### REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

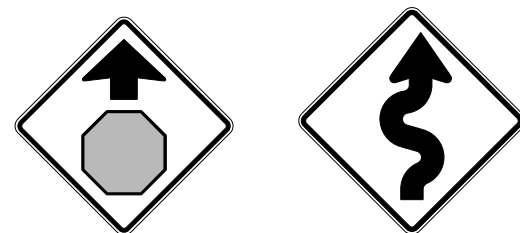
(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### REQUIREMENTS FOR WARNING SIGNS



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

### REQUIREMENTS FOR SCHOOL SIGNS



#### TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B <sub>FL</sub> OR C <sub>FL</sub> SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

### GENERAL NOTES

- Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
- Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
- Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
- Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
- White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
- Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
- Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
- Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
Less than 7.5	0.080
7.5 to 15	0.100
Greater than 15	0.125

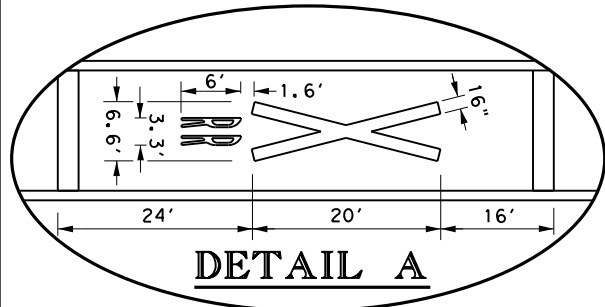
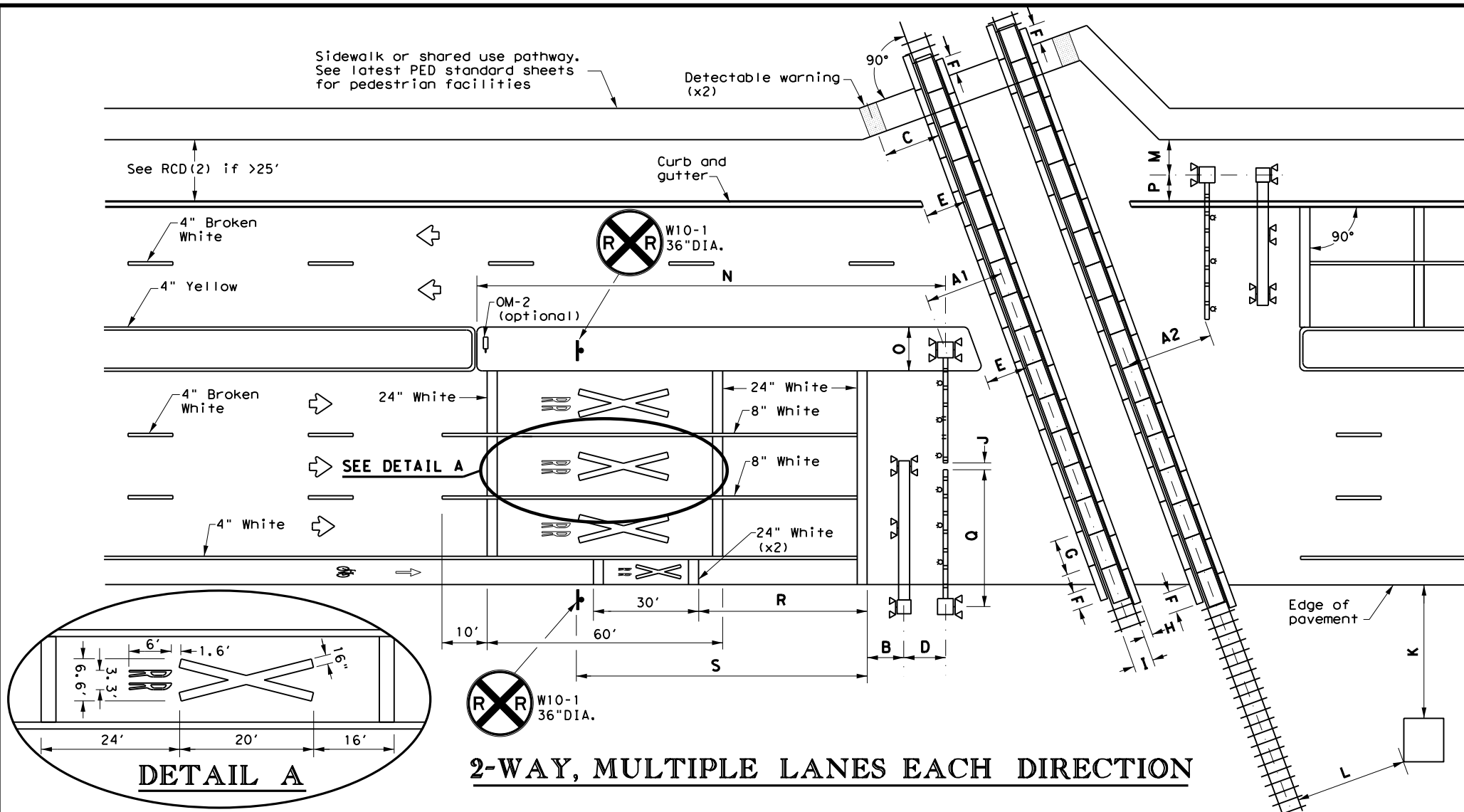
DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website:  
<http://www.txdot.gov/>

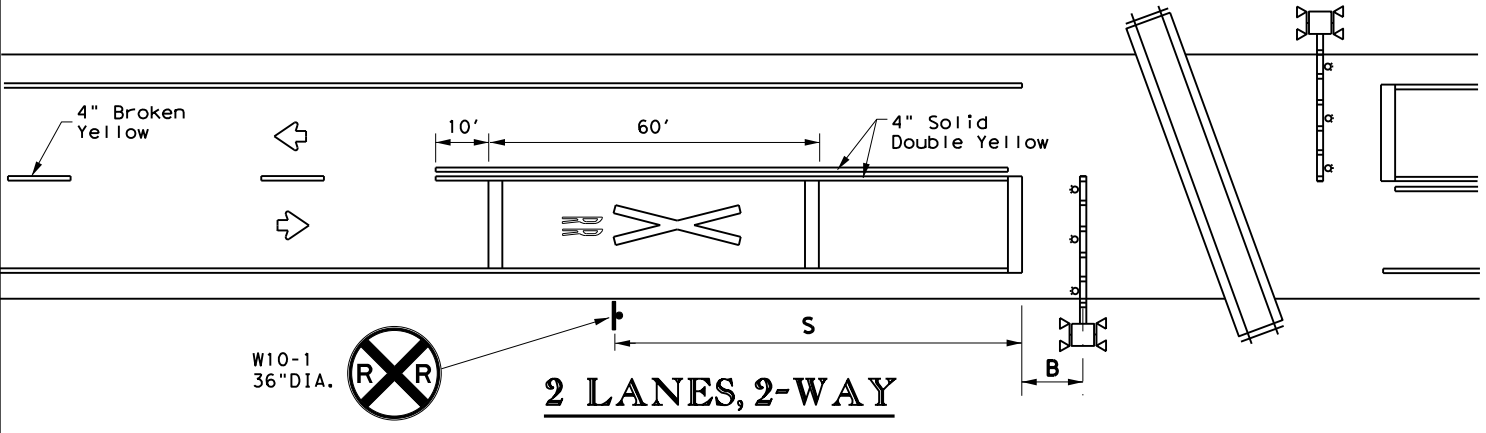
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<h3>TSR(4) - 13</h3>					
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© TxDOT	October 2003	CONT:	SECT:	JOB:	HIGHWAY:
REVISIONS		0046	06	082	US 82
12-03	7-13	DIST:	COUNTY:	SHEET NO.	
9-08		ATL	BOWIE	51	

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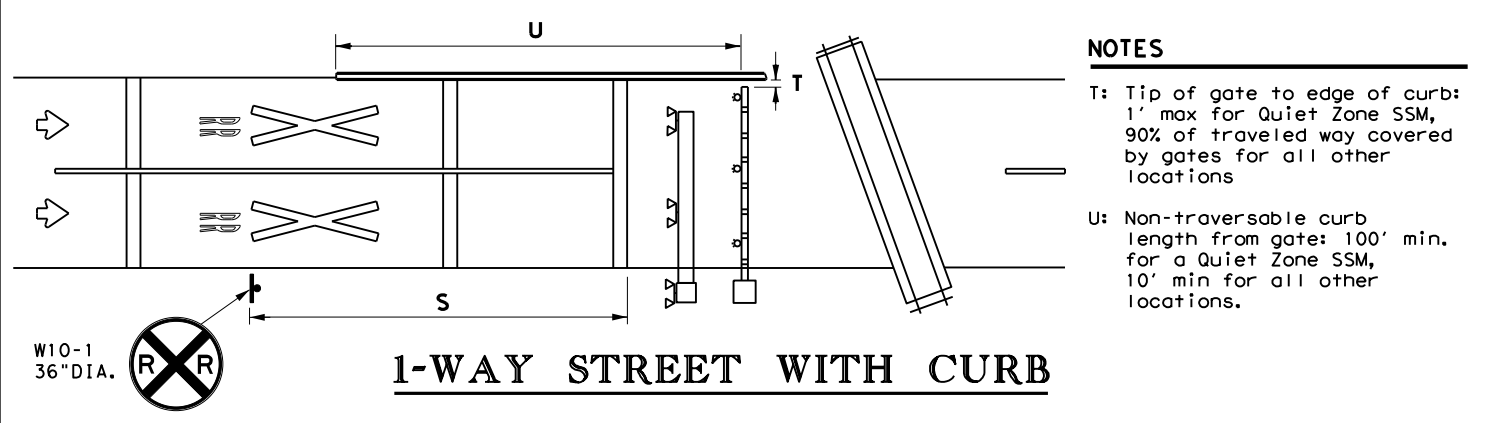
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**2-WAY, MULTIPLE LANES EACH DIRECTION**



**2 LANES, 2-WAY**



**1-WAY STREET WITH CURB**

- NOTES**
- T: Tip of gate to edge of curb: 1' max for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations
  - U: Non-traversable curb length from gate: 100' min. for a Quiet Zone SSM, 10' min for all other locations.

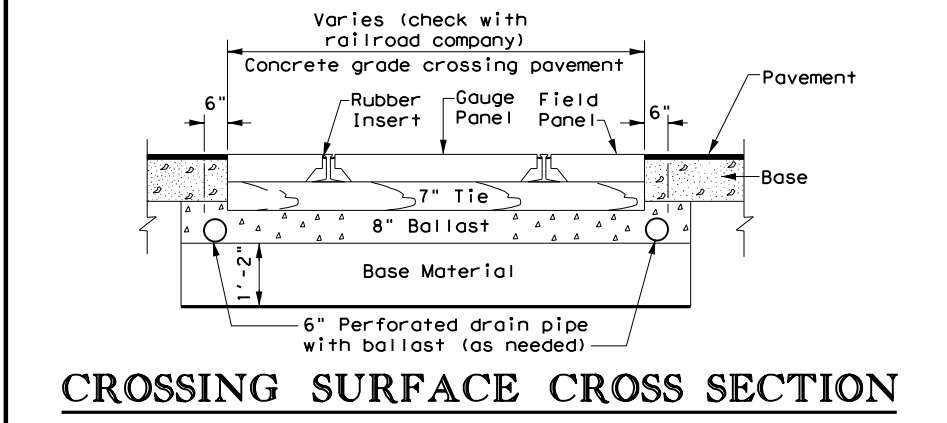
**TABLE 1**

Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

**LEGEND**

	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	Mast Flasher Pair

- GENERAL NOTES**
- Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
  - Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
  - Medians preferred whenever possible to prevent vehicles from driving around gates.
  - Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
  - See SMD standard sheets for sign mounting details.
  - See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.



**CROSSING SURFACE CROSS SECTION**

- NOTES**
- A1: Center of RR mast to center of rail: 12' minimum, 15' typical.
  - A2: Tip of gate to center of rail: 12' minimum, 15' typical.
  - B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).
  - C: Center of detectable warning device to nearest rail: 6' minimum
  - D: Center of gate mast to center of cantilever mast: 6' typical. NOTE: Cantilever may be located in front or behind gates.
  - E: Edge of median or curb to nearest rail: 10' typical. NOTE: Design median edge to be parallel with rail.
  - F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum. NOTE: Field panels need not be in line with gauge panels.
  - G: Length of panels along rail: 8' typical.
  - H: Width of field panel: 2' typical (check with railroad company).
  - I: Distance between rails: 4'-8.5".
  - J: Tip of gate to tip of gate: 2' maximum for Quiet Zone SSM or 90% of traveled way covered by gates for all other locations.
  - K: Nearest edge of RR cabin from edge of pavement: 30' typical. NOTE: Cabinet not required to be parallel to edge of pavement.
  - L: Nearest edge of RR cabin from nearest rail: 25' typical.
  - M: Center of RR mast to edge of sidewalk: 6' minimum.
  - N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60' will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.
  - O: Width of median: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.
  - P: Center of RR mast to face of curb: 4'-3" minimum. Center of RR mast to edge of pavement (with shoulder): 6' minimum. Center of RR mast to edge of pavement (no shoulder): 8'-3" minimum. NOTE: BNSF prefers 5'-3", 7', and 9'-3" minimums, respectively.
  - Q: Gate length: 28' or less typical, but railroad company may allow up to 32' under special circumstances.
  - R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.
  - S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.

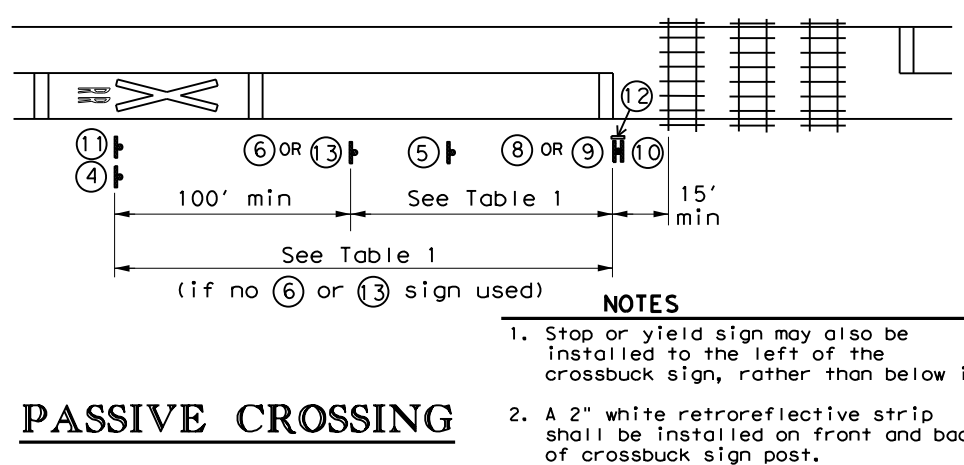
Texas Department of Transportation  
 Traffic Operations Division Standard

**RAILROAD CROSSING DETAILS  
 SIGNING, STRIPING, AND  
 DEVICE PLACEMENT  
 RCD(1)-16**

FILE: rcd1-16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT FEBRUARY 2016 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY	SHEET NO.	
	ATL	BOWIE	52	

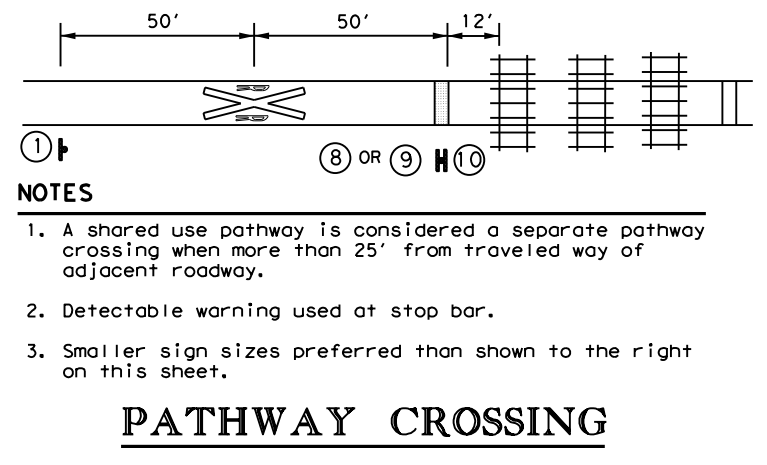
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**PASSIVE CROSSING**

- NOTES**
1. Stop or yield sign may also be installed to the left of the crossbuck sign, rather than below it.
  2. A 2" white retroreflective strip shall be installed on front and back of crossbuck sign post.



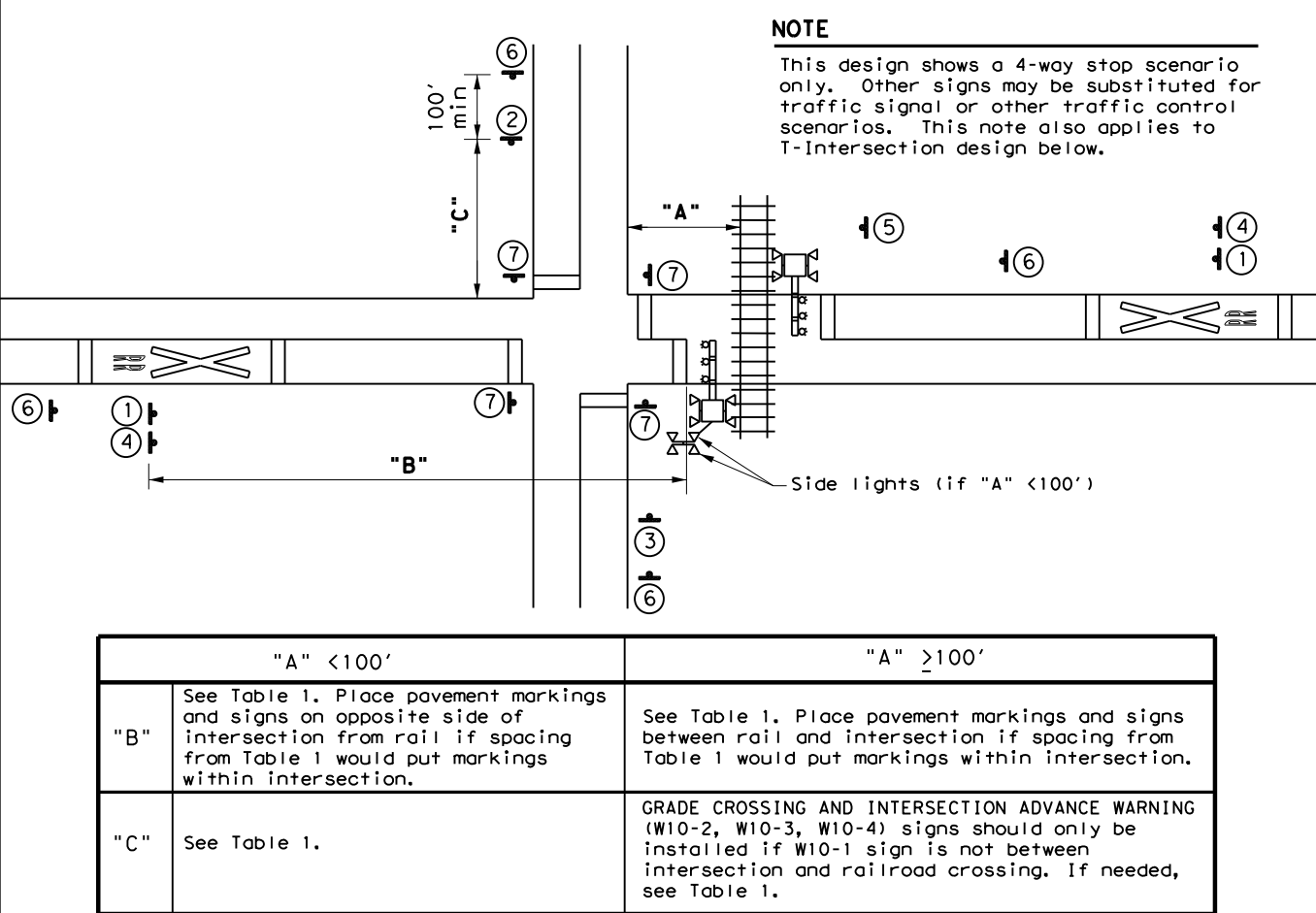
**PATHWAY CROSSING**

- NOTES**
1. A shared use pathway is considered a separate pathway crossing when more than 25' from traveled way of adjacent roadway.
  2. Detectable warning used at stop bar.
  3. Smaller sign sizes preferred than shown to the right on this sheet.

**TABLE 1**

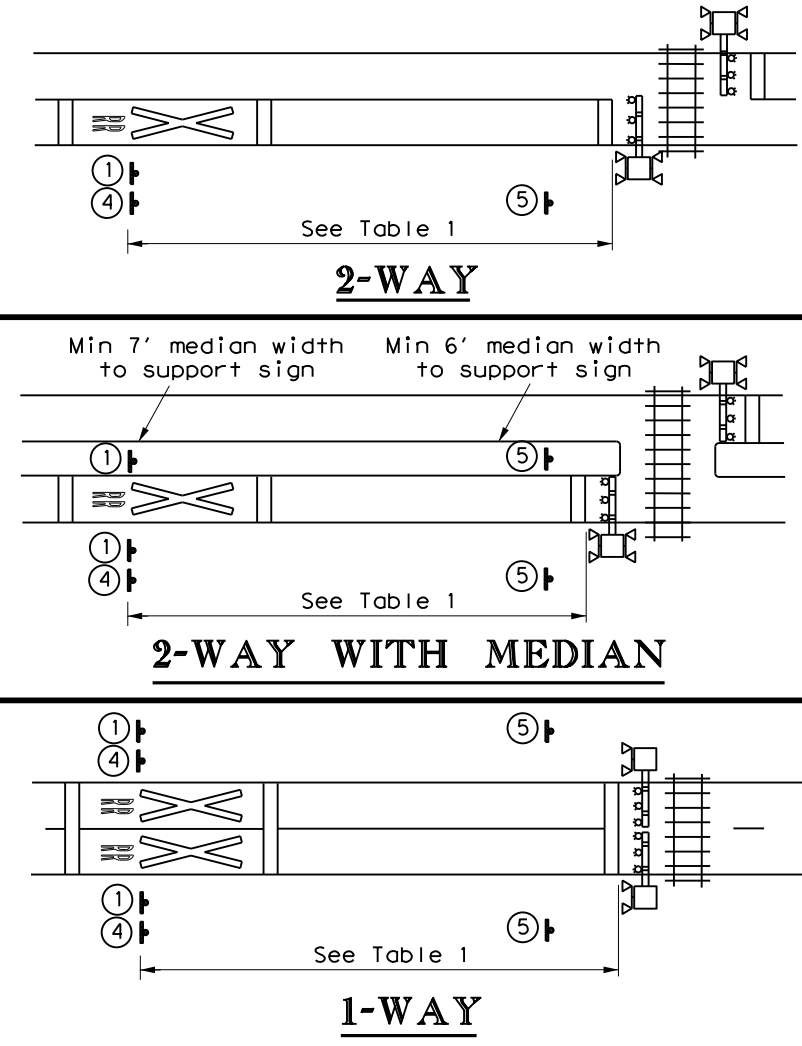
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

- GENERAL NOTES**
1. Railroad company to provide active traffic control devices, CROSSBUCK (R15-1), NUMBER OF TRACKS Plaque (R15-2P) (if more than 1 track), and EMERGENCY NOTIFICATION (I-13) signs.
  2. LOW GROUND CLEARANCE (W10-5) signs may be relocated further upstream of crossing to provide advance warning of alternate route.
  3. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2) signs may be modified as needed to fit roadway geometry.
  4. Table 1 placement distances may vary per Sect. 2C.05 of the TMUTCD.
  5. See Table 1 to determine placement of STOP AHEAD (W3-1) and YIELD AHEAD (W3-2) signs unless shown otherwise.
  6. DO NOT STOP ON TRACKS (R8-8) signs installed when potential for vehicles stopping on tracks is significant as determined by sealing engineer. Install so sign does not block view of RR mast.
  7. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.



**GRADE CROSSING NEAR A PARALLEL STREET**

	"A" < 100'	"A" ≥ 100'
"B"	See Table 1. Place pavement markings and signs on opposite side of intersection from rail if spacing from Table 1 would put markings within intersection.	See Table 1. Place pavement markings and signs between rail and intersection if spacing from Table 1 would put markings within intersection.
"C"	See Table 1.	GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2, W10-3, W10-4) signs should only be installed if W10-1 sign is not between intersection and railroad crossing. If needed, see Table 1.



**2-WAY**

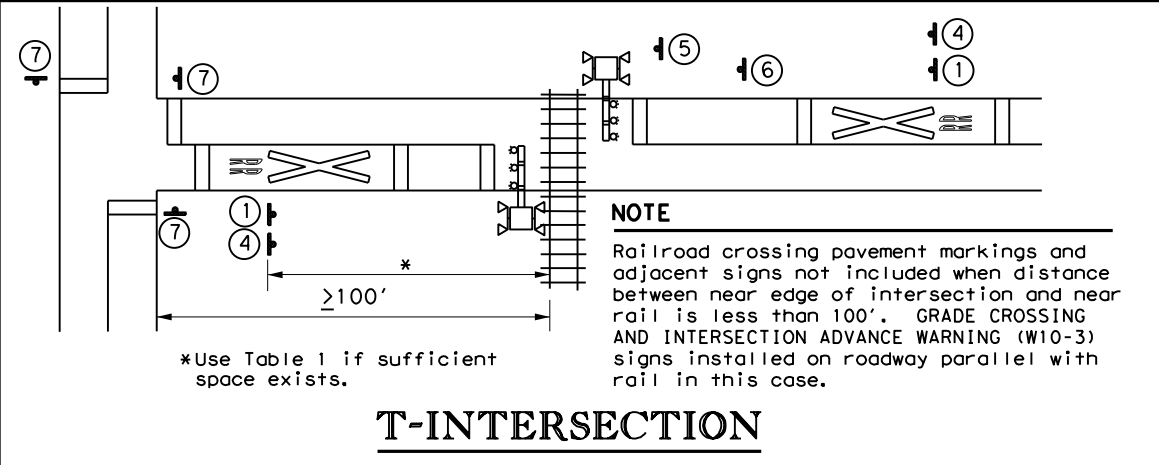
**2-WAY WITH MEDIAN**

**1-WAY**

**SIGNS**

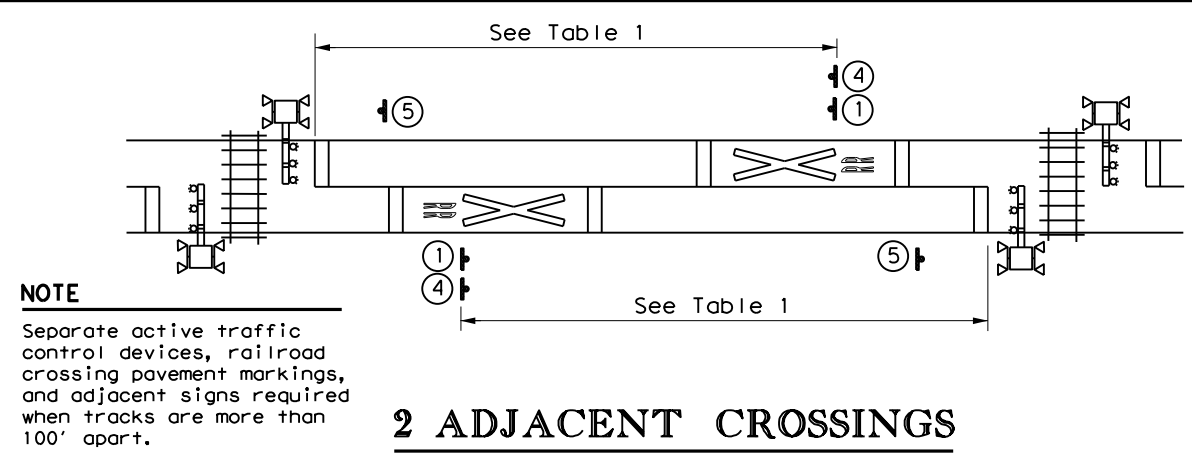

**IF NEEDED**

\*\* Includes a NO TRAIN HORN Plaque (W10-9P) if crossing is in a Quiet Zone. LOW GROUND CLEARANCE Plaque (W10-5P) if needed is mounted below W10-2/W10-3/W10-4 signs.



**T-INTERSECTION**

- NOTE**
- Railroad crossing pavement markings and adjacent signs not included when distance between near edge of intersection and near rail is less than 100'. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-3) signs installed on roadway parallel with rail in this case.
- \*Use Table 1 if sufficient space exists.



**2 ADJACENT CROSSINGS**

- NOTE**
- Separate active traffic control devices, railroad crossing pavement markings, and adjacent signs required when tracks are more than 100' apart.

Texas Department of Transportation Traffic Operations Division Standard

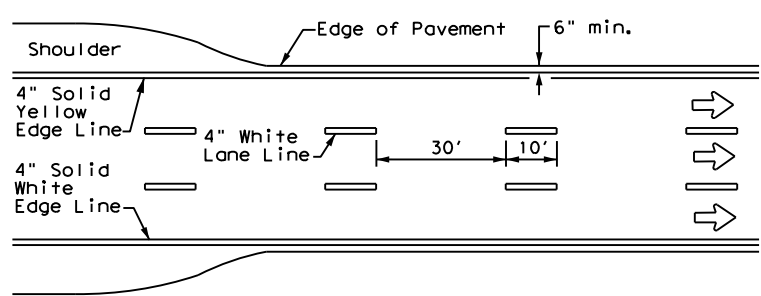
**RAILROAD CROSSING DETAILS SIGNING & STRIPING**

**RCD(2)-16**

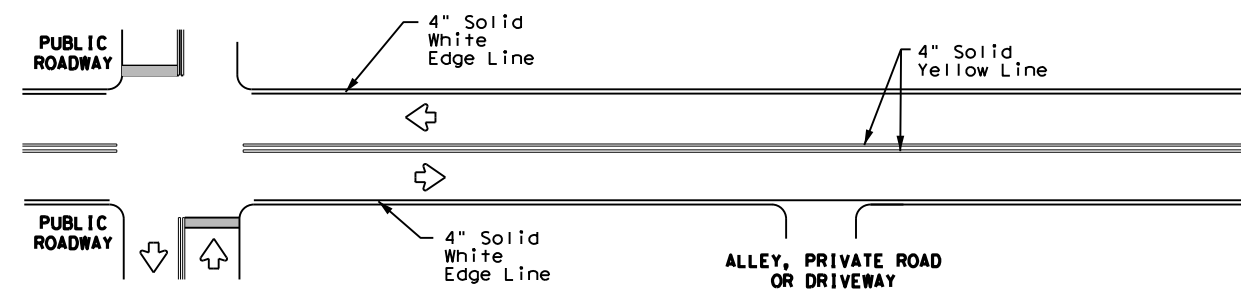
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©TxDOT FEBRUARY 2016 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	ATL	BOWIE	53	

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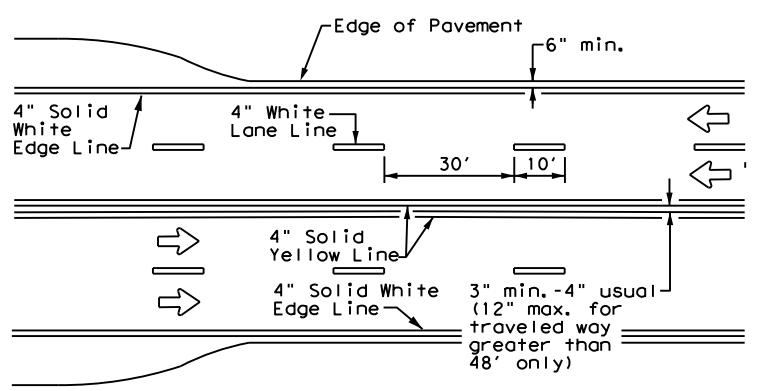
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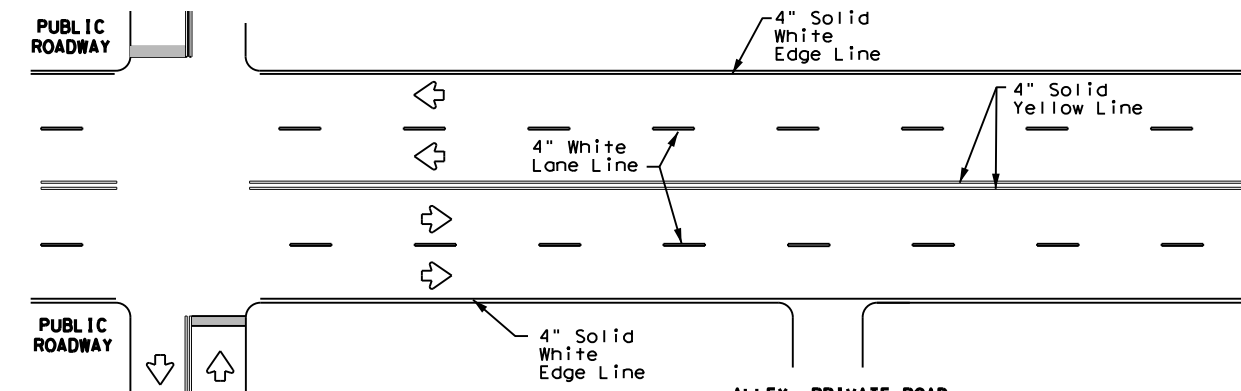
**EDGE LINE AND LANE LINES  
ONE-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



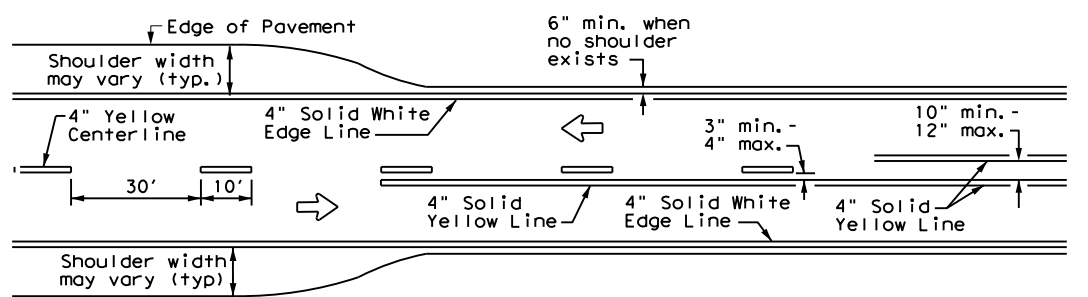
**TYPICAL TWO-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



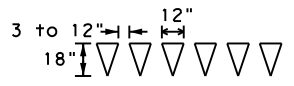
**CENTERLINE AND LANE LINES  
FOUR LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**



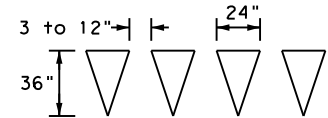
**TYPICAL MULTI-LANE, TWO-WAY PAVEMENT  
MARKINGS THROUGH INTERSECTIONS**



**TWO LANE TWO-WAY ROADWAY  
WITH OR WITHOUT SHOULDERS**

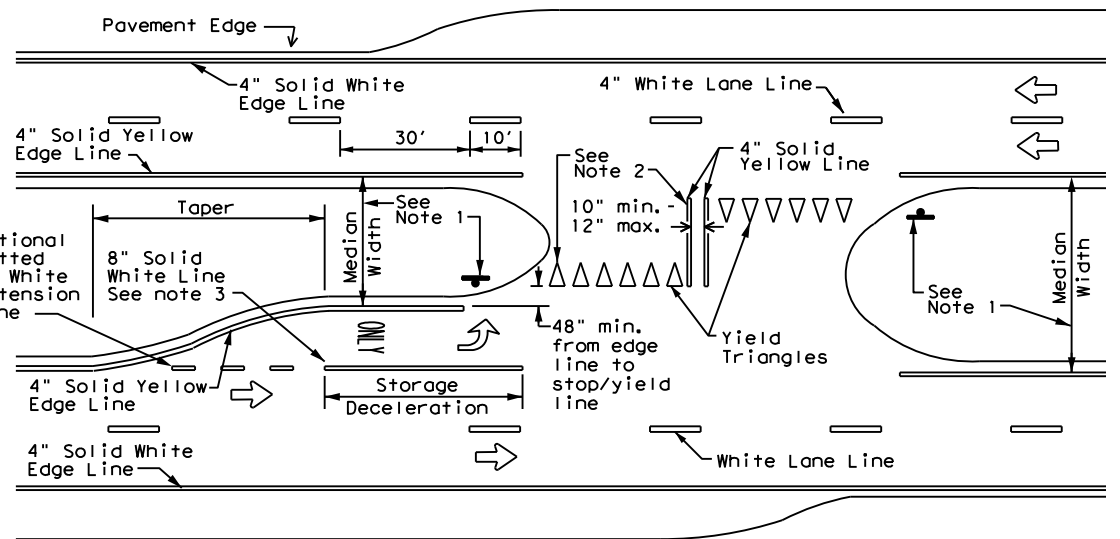


For posted speed on road being marked equal to or less than 40 MPH.



For posted speed on road being marked equal to or greater than 45 MPH.

**YIELD LINES**



**FOUR LANE DIVIDED ROADWAY CROSSOVERS**

**NOTES**

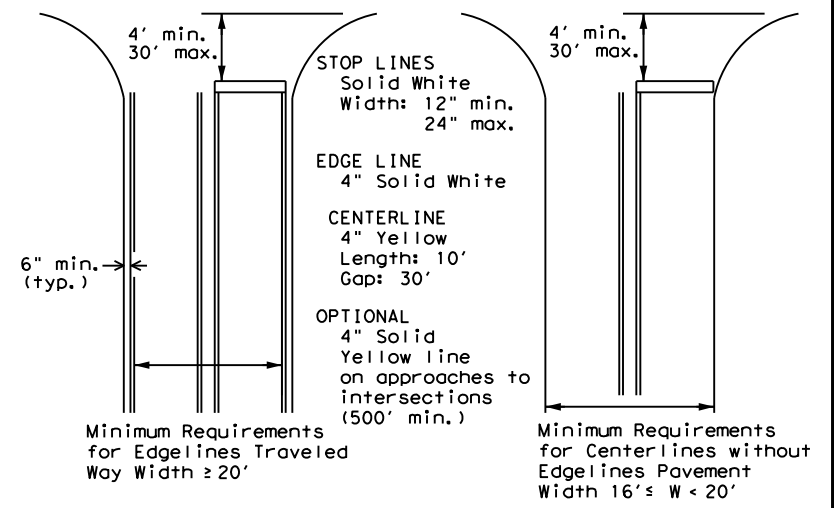
- Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs are optional as determined by the Engineer.
- Install median striping (double yellow centerlines and stop bars/yield triangles) when a 50' or greater median centerline can be placed. Stop bars shall only be used with stop signs. Yield triangles shall only be used with yield signs.
- Length of turn bays, including taper, deceleration, and storage lengths shall be as shown in the plans or as directed by the Engineer.

**GENERAL NOTES**

- Edgeline striping shall be as shown in the plans or as directed by the Engineer. The edgeline should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edgelines are not required in curb and gutter sections of roadways.
- The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the inside of edgeline to the inside of edgeline of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



**GUIDE FOR PLACEMENT OF STOP LINES,  
EDGE LINE & CENTERLINE**

Based on Traveled Way and Pavement Widths for Undivided Highways



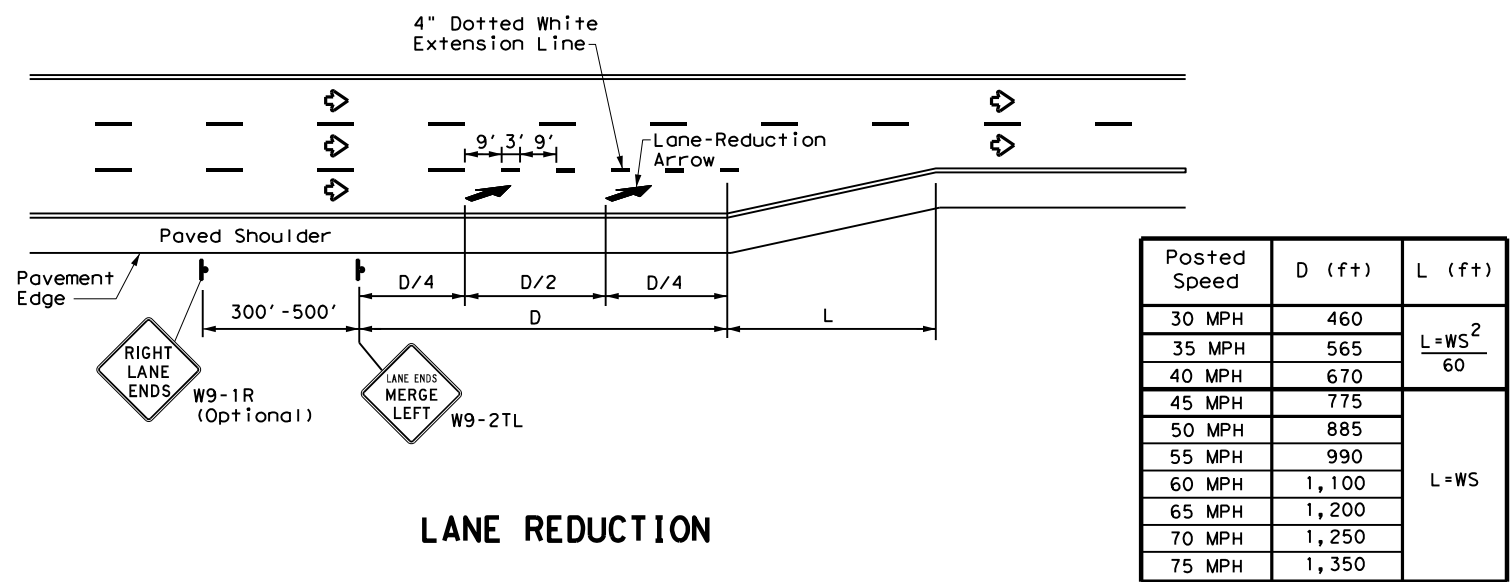
**TYPICAL STANDARD  
PAVEMENT MARKINGS**

**PM(1)-20**

FILE: pm1-20.dgn	DN:	CK:	DW:	CK:
© TxDOT November 1978	CONT	SECT	JOB	HIGHWAY
8-95 3-03 REVISIONS	0046	06	082	US 82
5-00 2-12	DIST	COUNTY	SHEET NO.	
8-00 6-20	ATL	BOWIE	54	

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Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	L = WS
45 MPH	775	
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

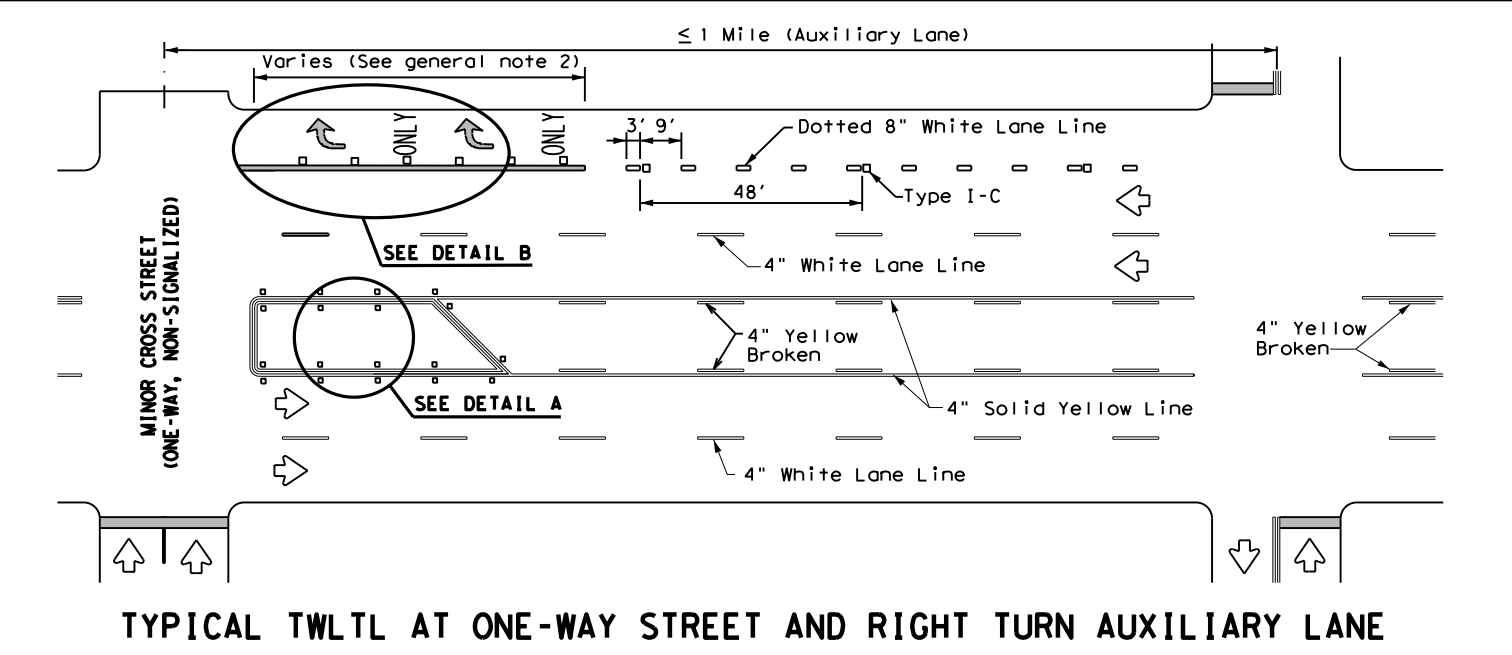
**LANE REDUCTION**

- NOTES**
- Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
  - On divided highways, an additional W9-1R "RIGHT LANE ENDS" sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
  - Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
  - For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

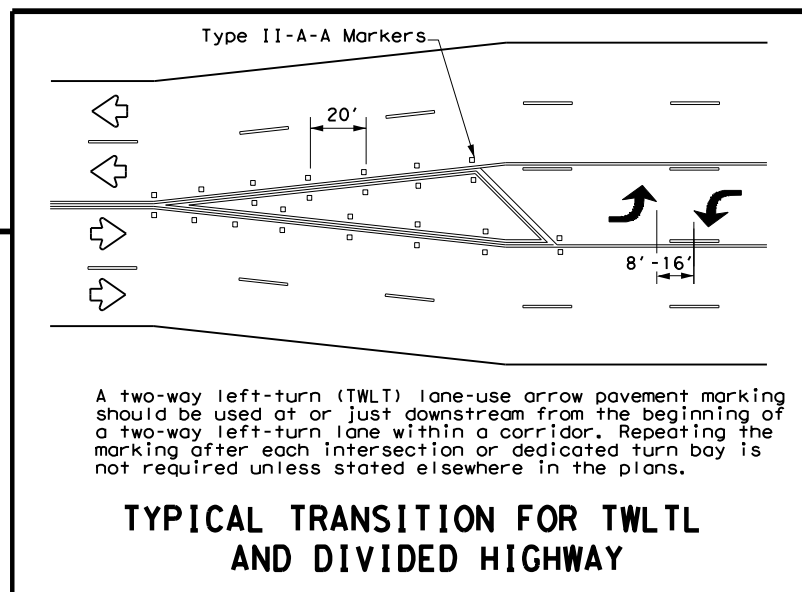
- GENERAL NOTES**
- Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
  - When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
  - Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
  - Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

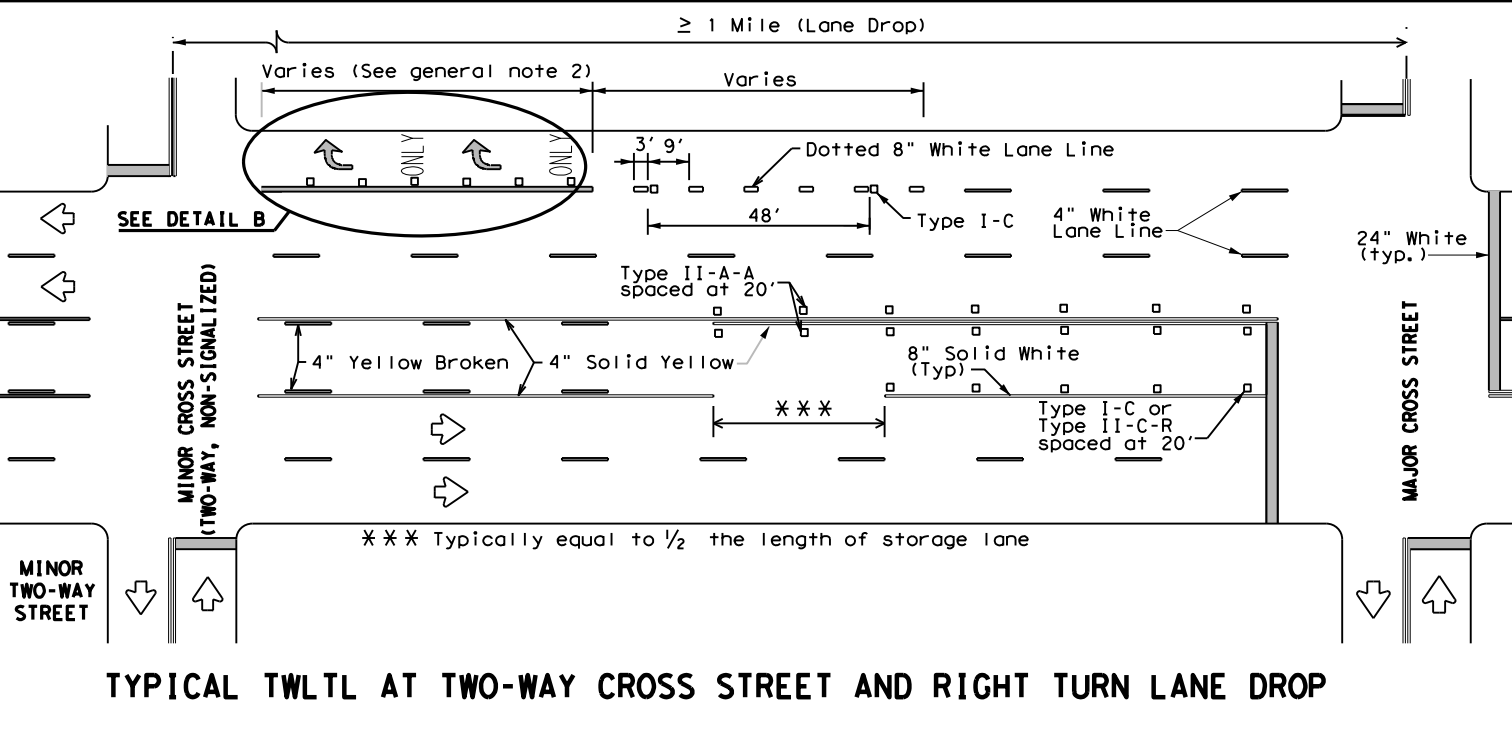
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



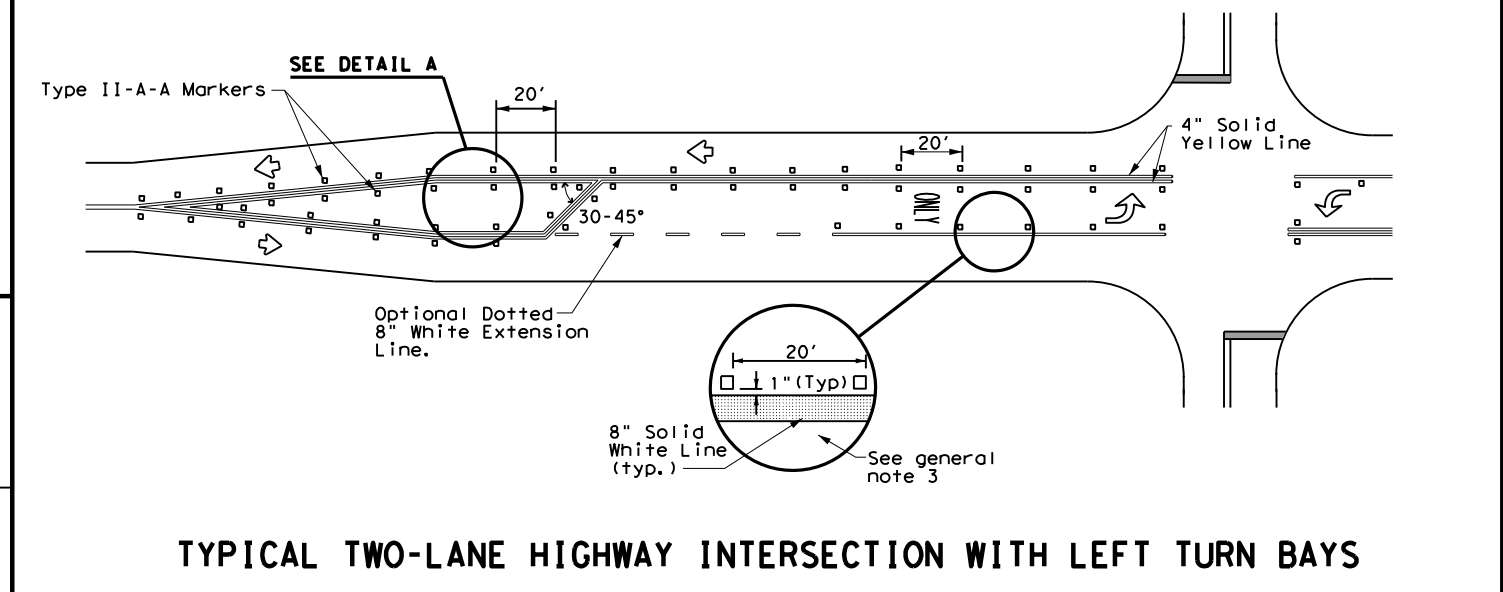
**TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE**



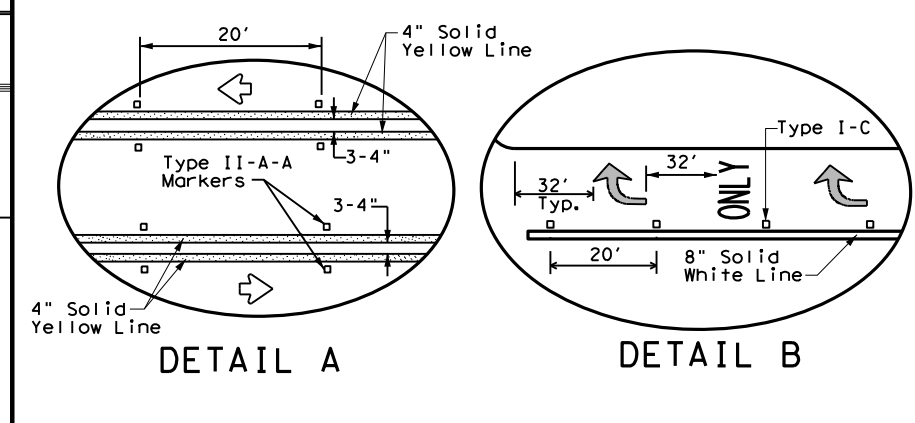
**TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY**



**TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP**



**TYPICAL TWO-LANE HIGHWAY INTERSECTION WITH LEFT TURN BAYS**



**DETAIL A**

**DETAIL B**

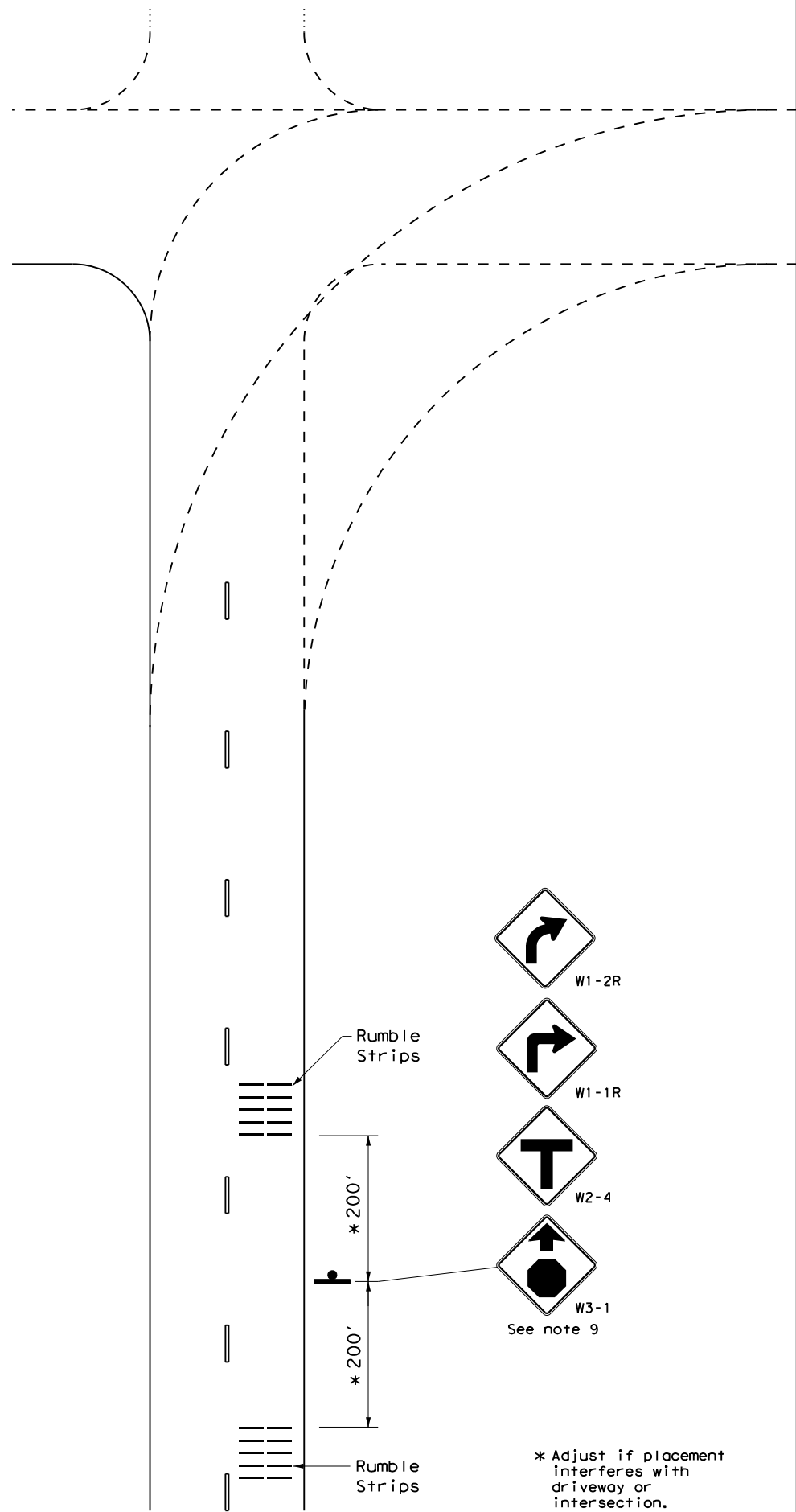
Texas Department of Transportation  
 Traffic Safety Division Standard

**TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-20**

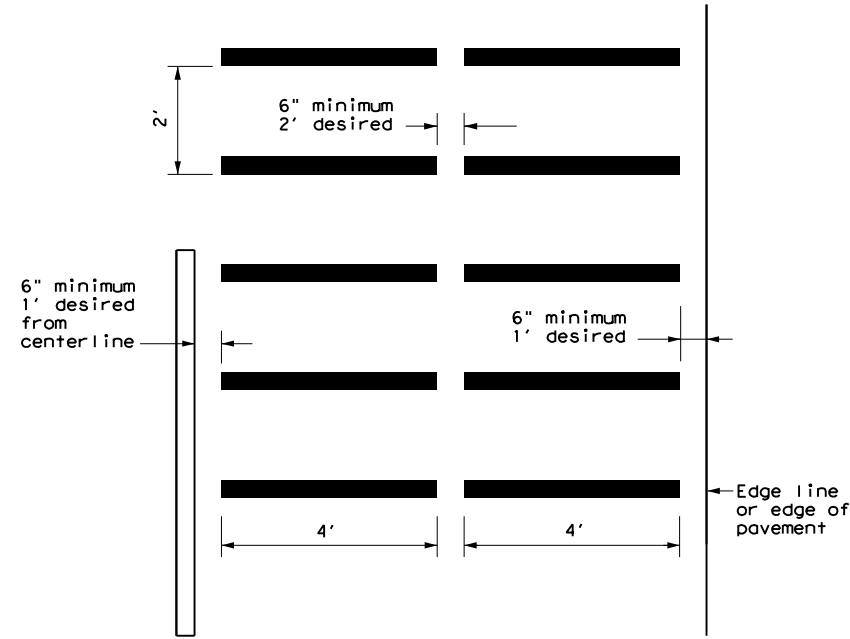
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5-00 2-10	DIST	COUNTY	SHEET NO.	
8-00 2-12	ATL	BOWIE	55	
3-03 6-20				

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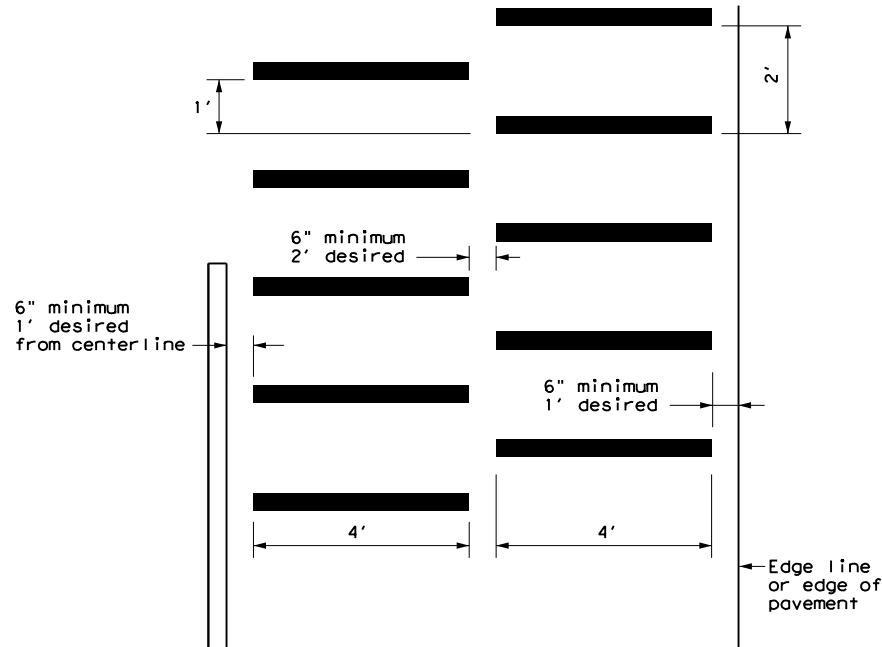
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### STANDARD PATTERN



### ALTERNATIVE PATTERN



### GENERAL NOTES

1. Transverse or in-lane rumble strips should only be used at high incident and special geometric locations. These special geometric locations may include: approaches to rural, high speed signalized or Stop-controlled intersections with sight restrictions and/or high crash rates, approaches to unexpected urban intersections, approaches to newly installed Stop or signalized controlled intersections, approaches to toll plazas, approaches to hazardous horizontal curves, and approaches to railroad grade crossings.
2. When used, the rumble strips shall be placed 200 feet prior to and after the placement of the warning device.
3. The use of rumble strips should not be widespread or used indiscriminately.
4. Prefabricated black raised rumble strips should be used. They should be installed in accordance with the manufacturer's recommendations.
5. A list of approved, prefabricated raised rumble strips can be obtained from the Traffic Operations Division.
6. Consideration should be given to noise levels when in-lane or transverse rumble strips are installed near residential areas, schools, churches, etc.
7. The use of the "Rumble Strips Ahead" sign may be used in advance of in-lane or transverse rumble strips, based on engineering judgement. This sign is typically not necessary for rumble strip installations built to the guidelines on this standard sheet. When used, this sign should be spaced in advance of the rumble strips based on the guidelines for advance placement of warning sign included in the "Texas Manual on Uniform Traffic Control Devices".



W17-2T

8. Consideration should be given to bicyclists. A 12 inch gap from the edge line may be used to accommodate bicyclists when a usable shoulder is not available. Additional gaps in the in-lane or transverse rumble strips are not recommended since they could cause motorists to swerve to avoid the rumble strips.

9. Other signs can be used as conditions warrant.



## TRANSVERSE OR IN-LANE RUMBLE STRIPS

### RS(5) - 13

FILE: rs(5)-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
2-10	DIST	COUNTY	SHEET NO.	
10-13	ATL	BOWIE	56	

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## SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

**Post Type**

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))  
 TWT = Thin-Walled Tubing (see SMD(TWT))  
 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))  
 S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

**Number of Posts (1 or 2)**

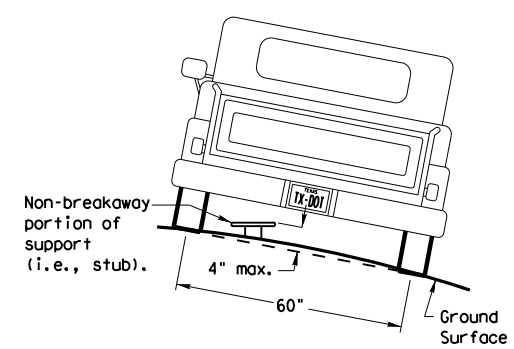
**Anchor Type**

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))  
 UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))  
 WS = Wedge Anchor Steel - (see SMD(TWT))  
 WP = Wedge Anchor Plastic (see SMD(TWT))  
 SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))  
 SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

**Sign Mounting Designation**

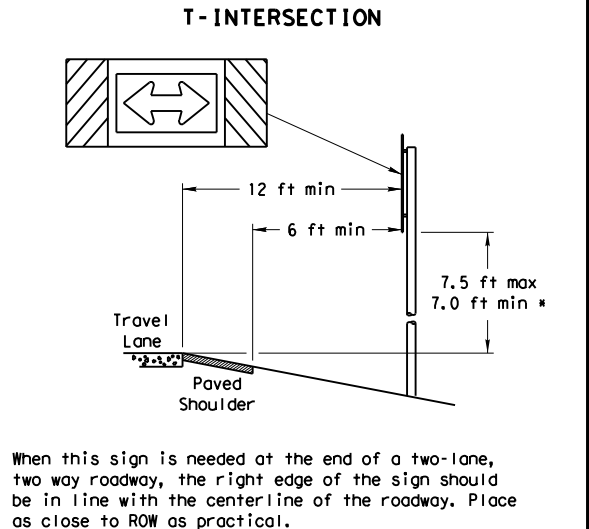
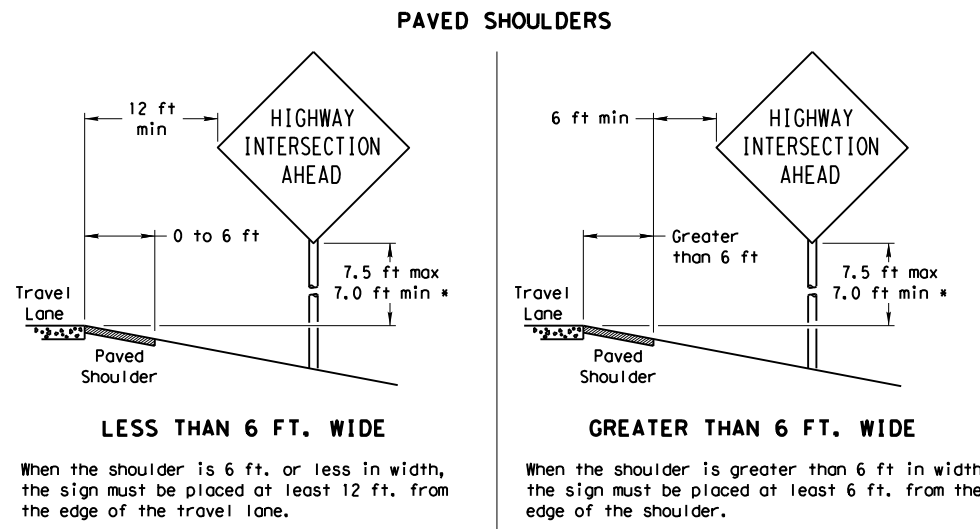
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))  
 T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))  
 IF REQUIRED  
 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))  
 BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))  
 WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))  
 EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

## REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

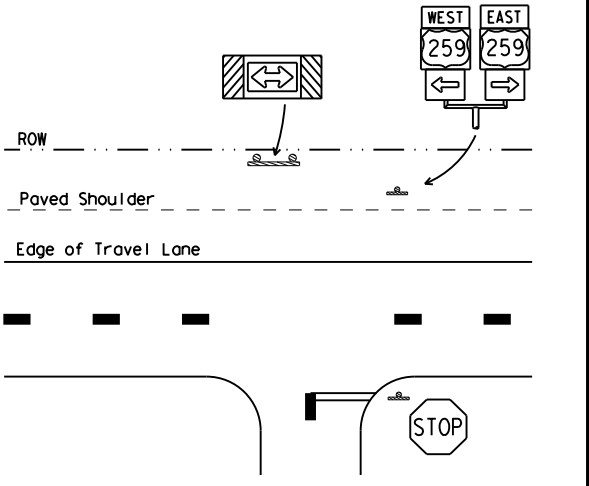
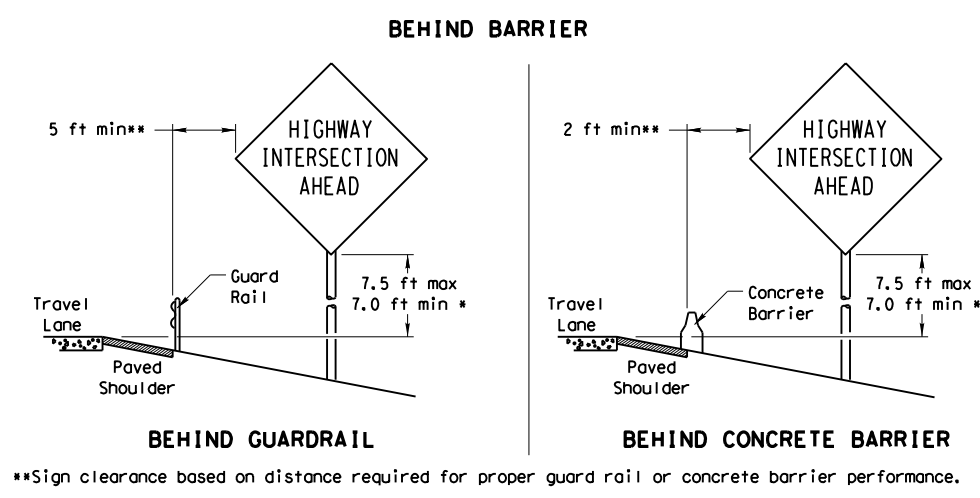
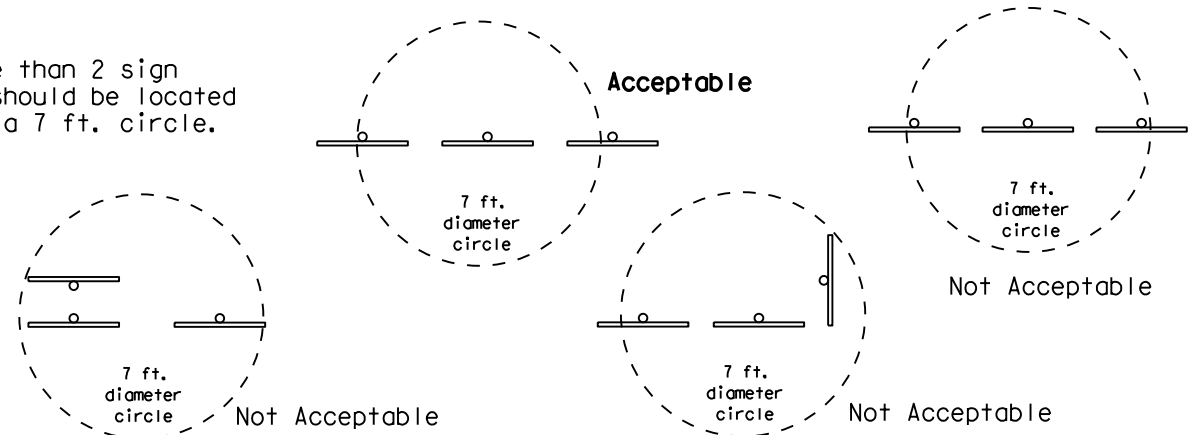


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

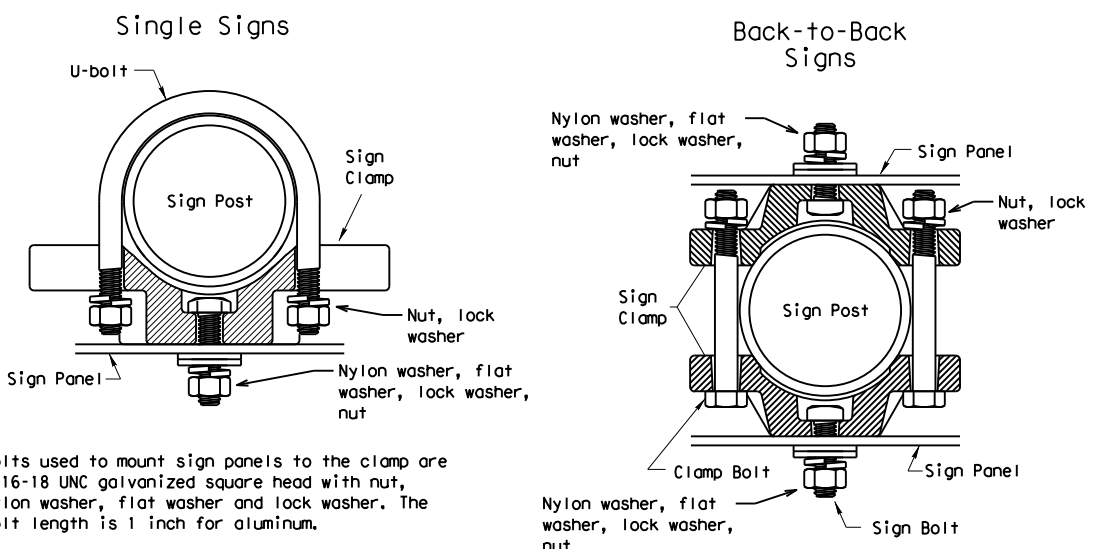
## SIGN LOCATION



No more than 2 sign posts should be located within a 7 ft. circle.



## TYPICAL SIGN ATTACHMENT DETAIL



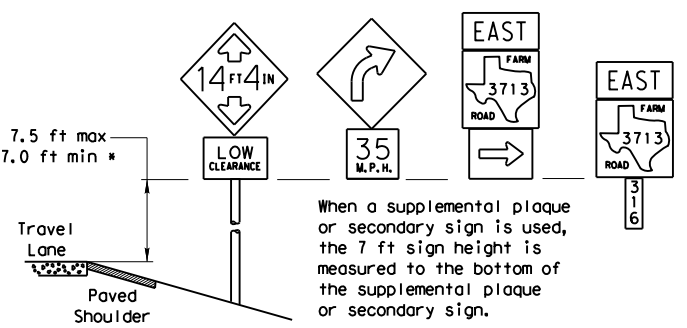
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

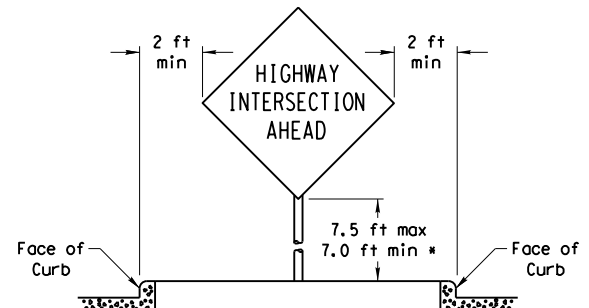
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

## SIGNS WITH PLAQUES

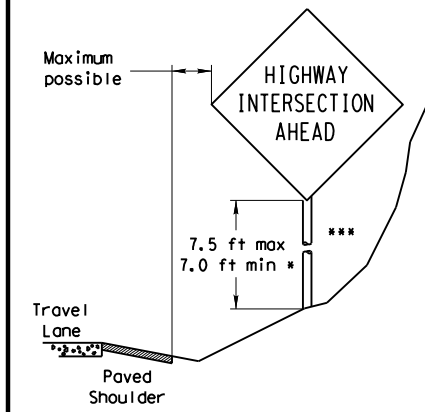


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

## CURB & GUTTER OR RAISED ISLAND



## RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

\*\*\* Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

\* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:  
<http://www.txdot.gov/publications/traffic.htm>



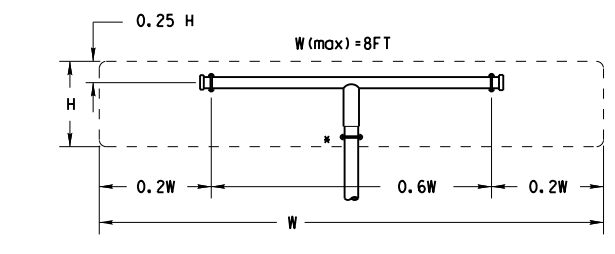
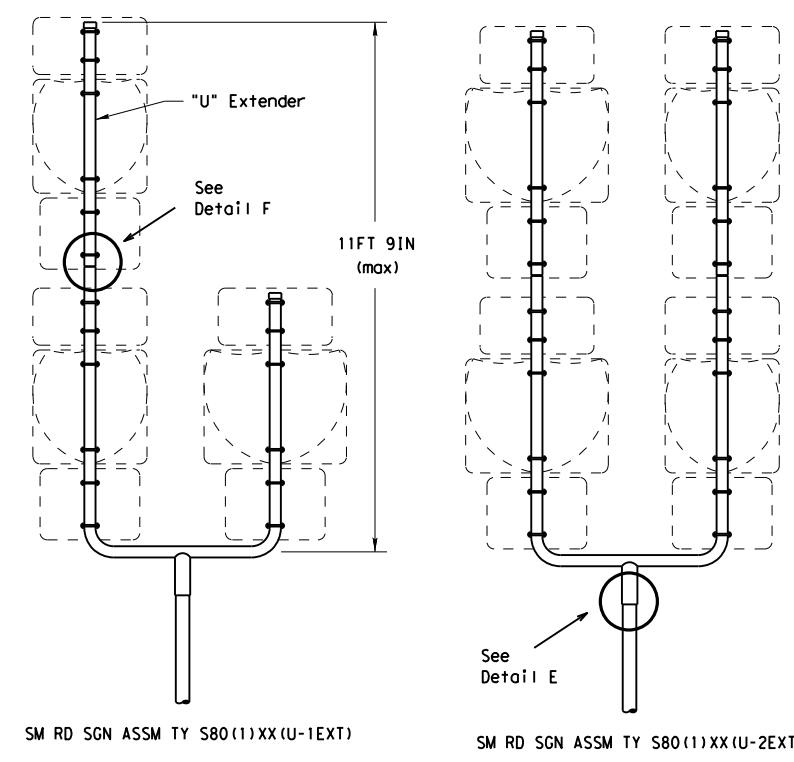
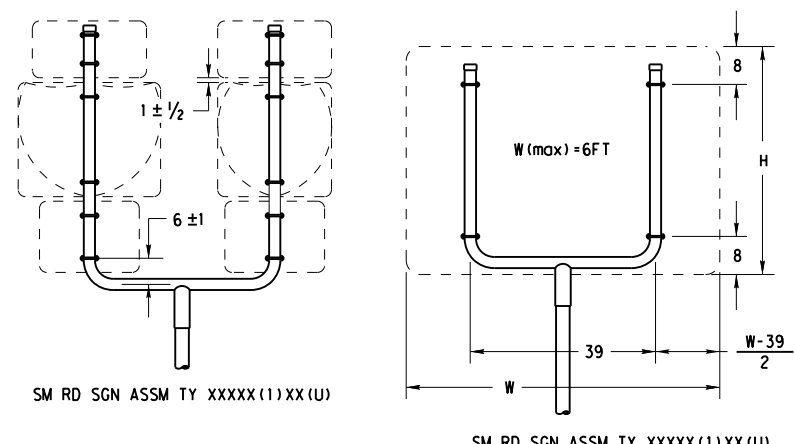
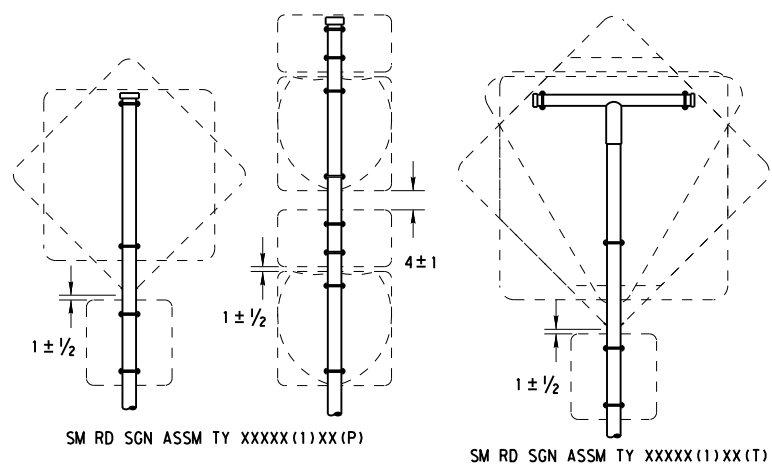
## SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

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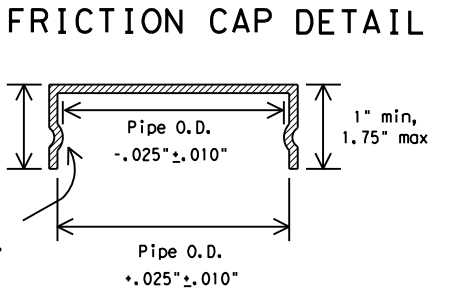
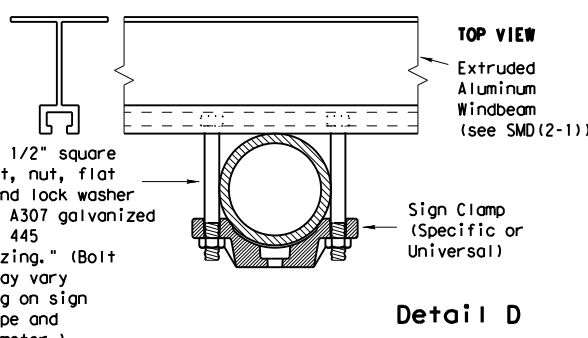
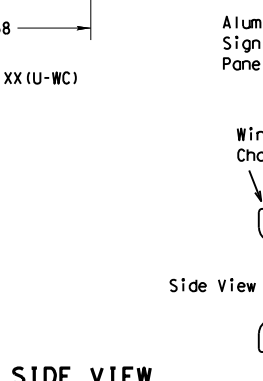
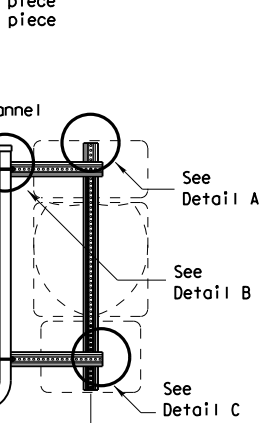
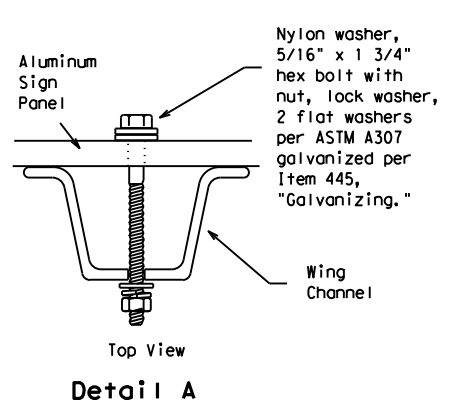
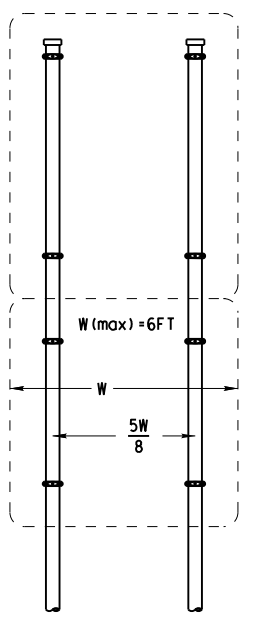
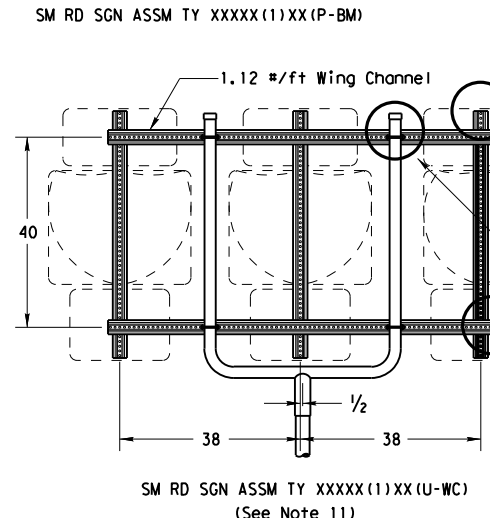
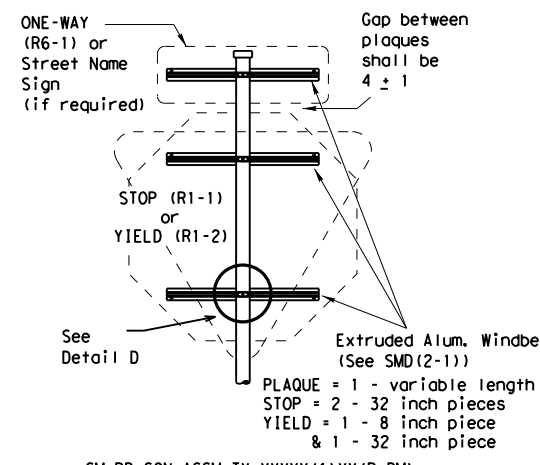
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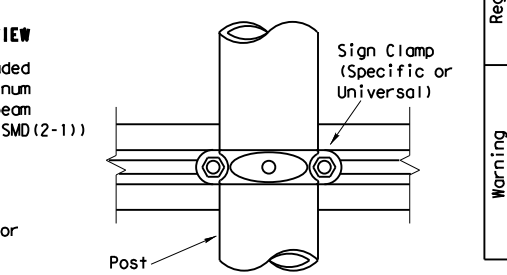
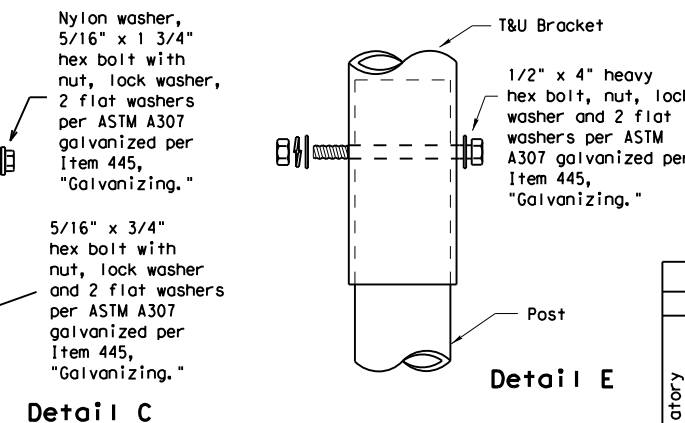
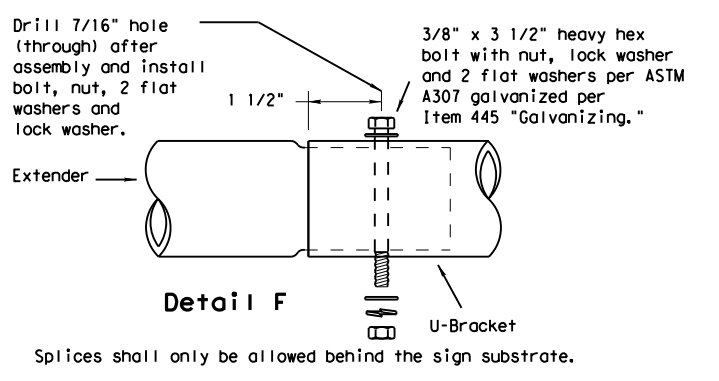
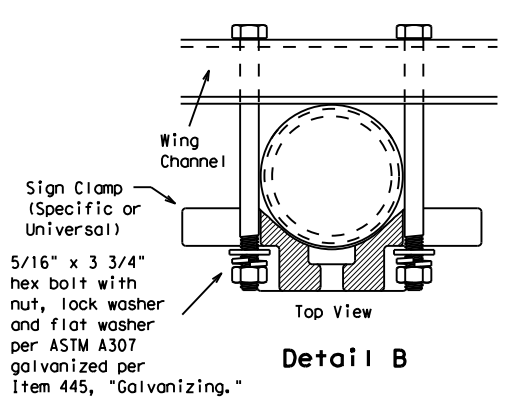


All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T) (\* - See Note 12)



Rolled Crimp to engage pipe O.D.



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes. The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture. Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1. SIGN SUPPORT # OF POSTS MAX. SIGN AREA
 

10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT		
SIGN DESCRIPTION	SUPPORT	
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Warning	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)	
Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)	



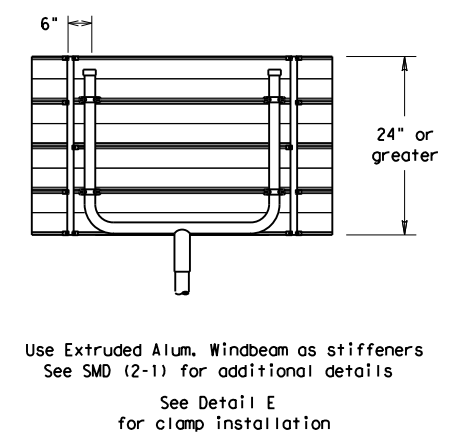
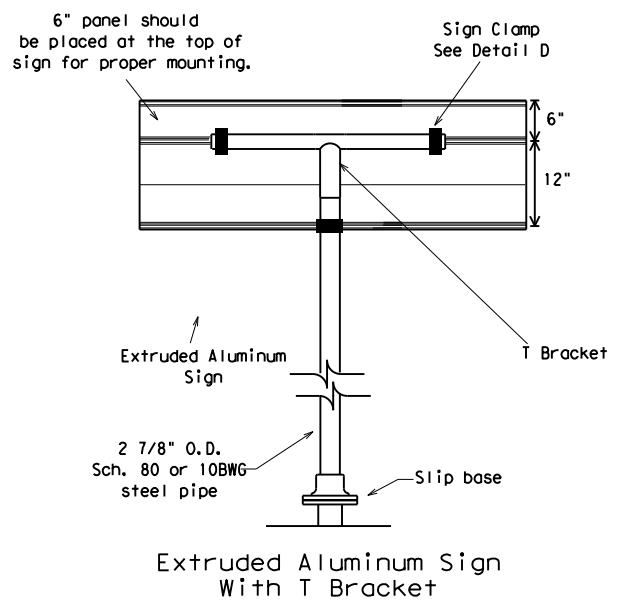
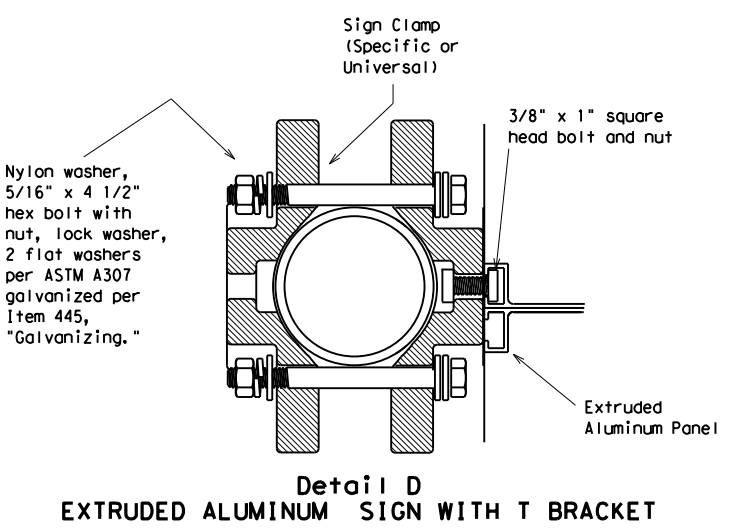
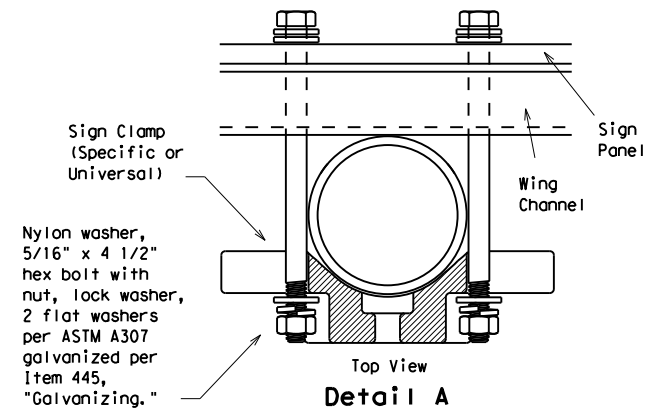
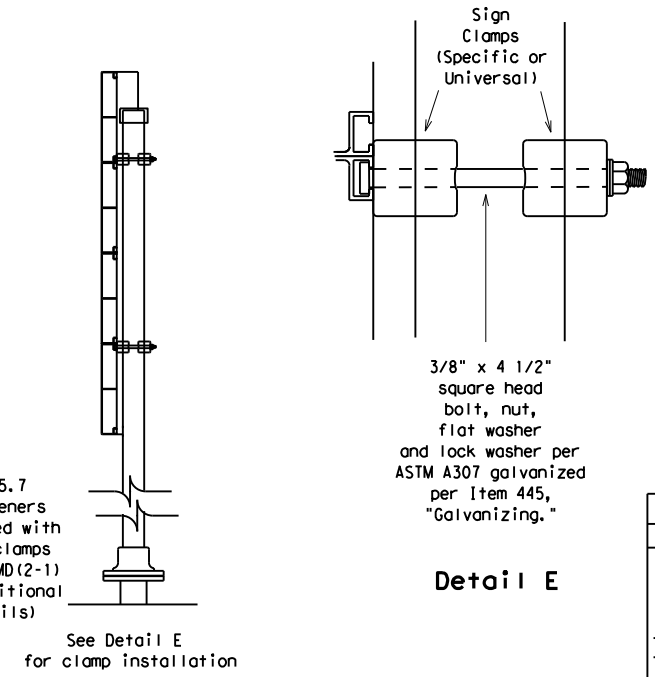
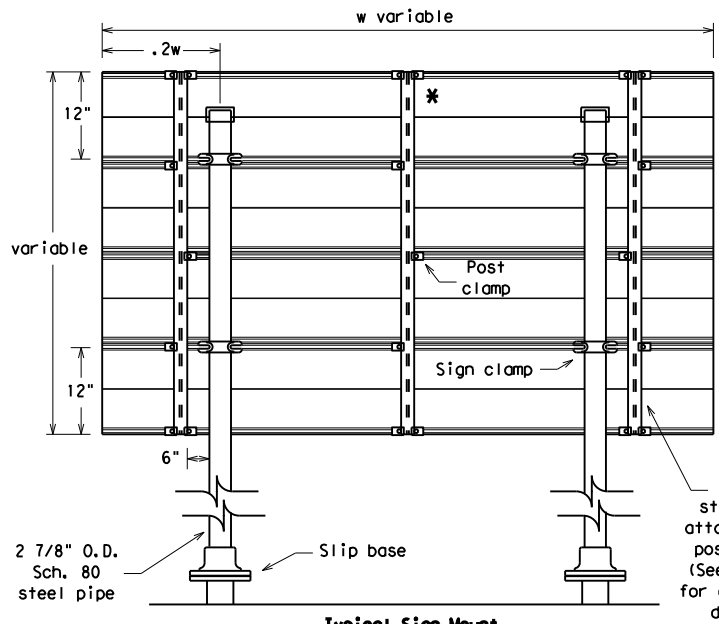
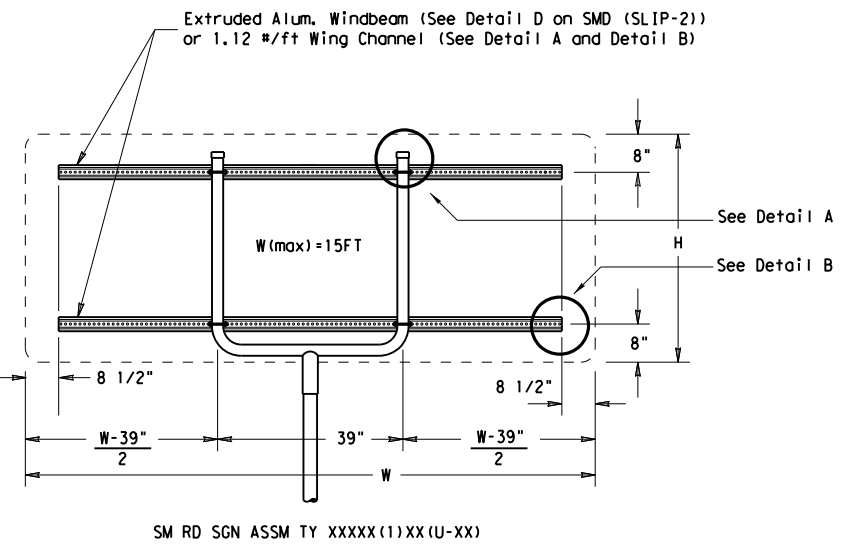
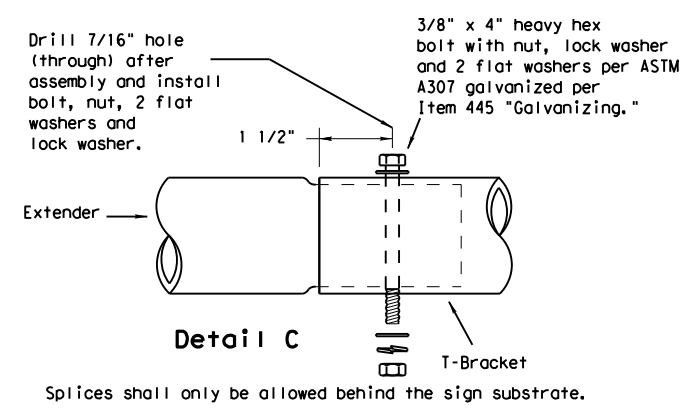
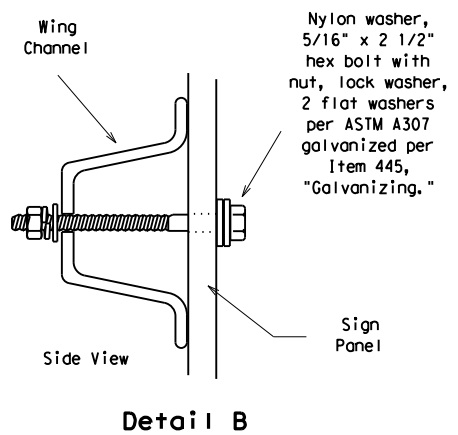
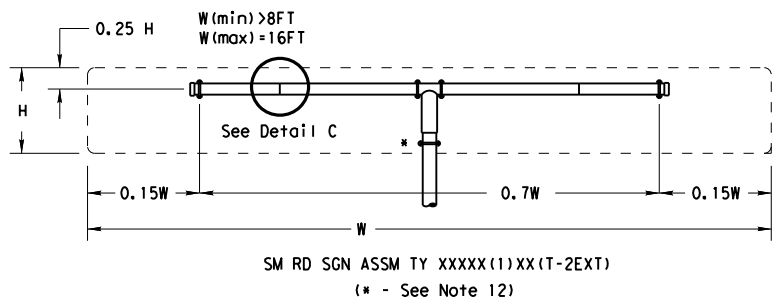
SIGN MOUNTING DETAILS  
 SMALL ROADSIDE SIGNS  
 TRIANGULAR SLIPBASE SYSTEM  
 SMD(SLIP-2)-08

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9-08	REVISIONS	CON: 0046	SECT: 06	JOB: 082	HIGHWAY: US 82
		DIST: ATL	COUNTY: BOWIE	SHEET NO. 58	



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GENERAL NOTES:

- | SIGN SUPPORT | # OF POSTS | MAX. SIGN AREA |
|--------------|------------|----------------|
| 10 BWG       | 1          | 16 SF          |
| 10 BWG       | 2          | 32 SF          |
| Sch 80       | 1          | 32 SF          |
| Sch 80       | 2          | 64 SF          |
- The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
- Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
- For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
- When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
- Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
- Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
- Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



**SIGN MOUNTING DETAILS  
 SMALL ROADSIDE SIGNS  
 TRIANGULAR SLIPBASE SYSTEM  
 SMD(SLIP-3)-08**

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9-08	REVISIONS	CON	SECT	JOB	HIGHWAY
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		DIST	COUNTY		SHEET NO.
		ATL	BOWIE		59

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**GENERAL NOTES FOR ALL ELECTRICAL WORK**

- The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.
- Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.
- Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is 1/2 in. or less in diameter.
- Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.
- Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.
- When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

**CONDUIT**

**A. MATERIALS**

- Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.
- Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.
- Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.



AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

- Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.
- Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.
- Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.
- Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

- Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.
- When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.
- Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

**B. CONSTRUCTION METHODS**

- Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.
- Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.
- Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.
- Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.
- When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."
- Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.
- During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.
- Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.
- Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.
- Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.
- At all electrical services, install a 6 AWG solid copper grounding electrode conductor.
- Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).
- Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.
- File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

			
<h1>ELECTRICAL DETAILS CONDUITS &amp; NOTES</h1>			
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DIST	COUNTY	SHEET NO.	
ATL	BOWIE	60	

# ELECTRICAL CONDUCTORS

## A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS) 11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.
2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.
3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.
4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

## B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.
2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.
3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight seal. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.
4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.
5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.
6. Support conductors in illumination poles with a J-hook at the top of the pole.
7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.
8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.
9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.
10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.
11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

## C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.
2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.
3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.
4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.
5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

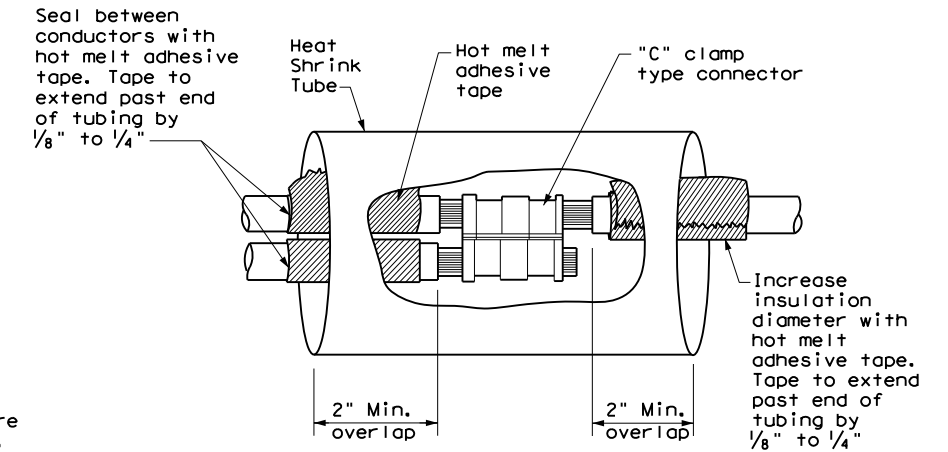
## GROUND RODS & GROUNDING ELECTRODES

### A. MATERIAL INFORMATION

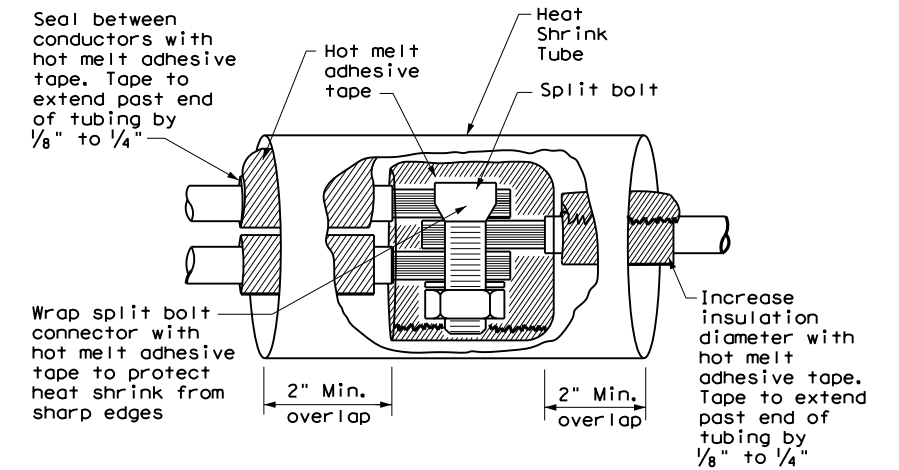
1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

### B. CONSTRUCTION METHODS

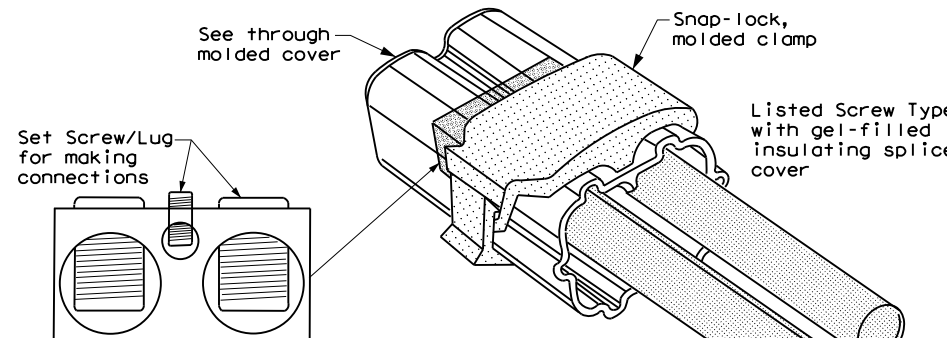
1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.
2. Do not place ground rods in the same drilled hole as a timber pole.
3. Install ground rods so the imprinted part number is at the upper end of the rod.
4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.
6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



**SPLICE OPTION 1  
Compression Type**



**SPLICE OPTION 2  
Split Bolt Type**



**SPLICE OPTION 3  
Listed Screw Type**

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		Traffic Operations Division Standard	
<h1>ELECTRICAL DETAILS CONDUCTORS</h1>			
<h2>ED(3) - 14</h2>			
FILE: ed3-14.dgn	DW: TxDOT	CK: TxDOT	CR: TxDOT
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REVISIONS	0046	06	082
	DIST	COUNTY	SHEET NO.
	ATL	BOWIE	61



**ELECTRICAL SERVICES NOTES**

- Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.
- Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.
- Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.
- Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.
- The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.
- Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.
- When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.
- Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.
- All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.
- Provide rigid metal conduit (RMC) for all conduits on service, except for the 1/2 in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.
- Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.
- Ensure all mounting hardware and installation details of services conform to utility company specifications.
- For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.
- When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 1/2 in. x 11 in. before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.
- Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

**SERVICE ASSEMBLY ENCLOSURE**

- Provide threaded hub for all conduit entries into the top of enclosure.
- Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photoceII or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.
- Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.
- Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

**MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS**

- Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.
- When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

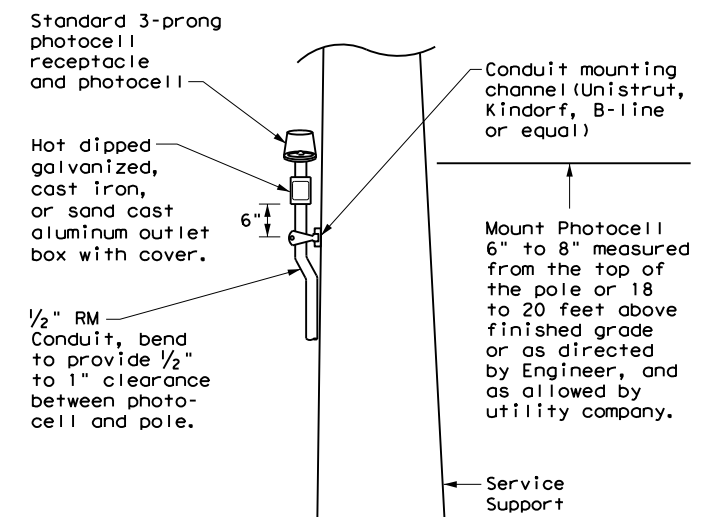
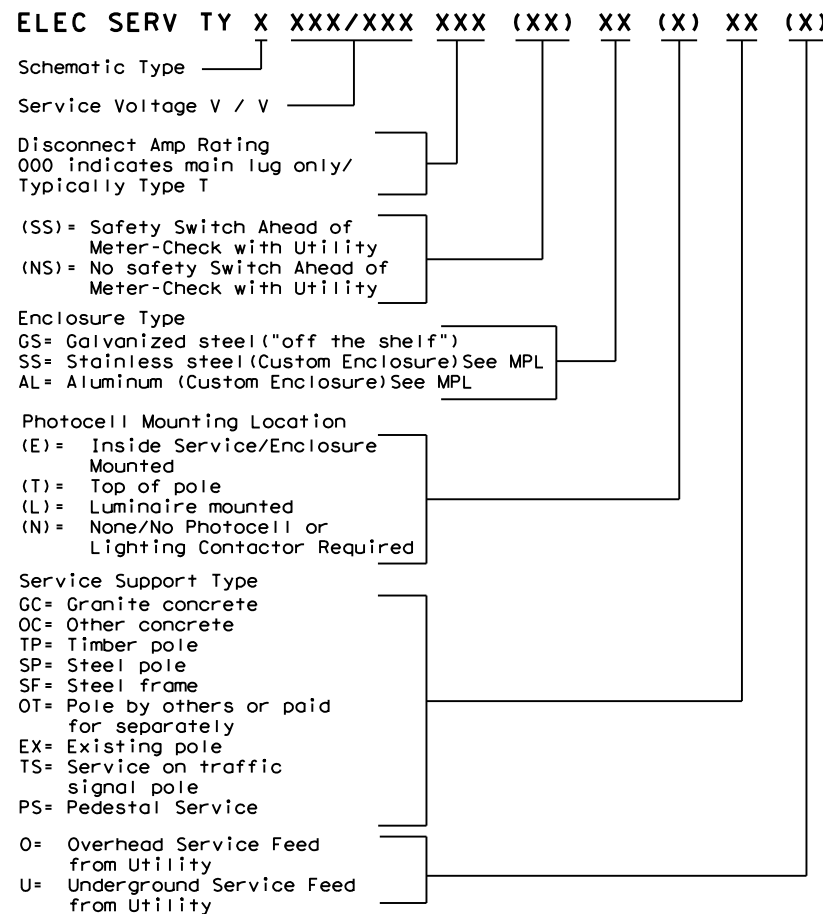
**PHOTOELECTRIC CONTROL**

- Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA												
Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 1/4"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 1/4"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

\* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.  
 \*\* Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National Electrical Code.

**EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE**



**TOP MOUNTED PHOTOCELL**

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation Traffic Operations Division Standard

**ELECTRICAL DETAILS SERVICE NOTES & DATA**

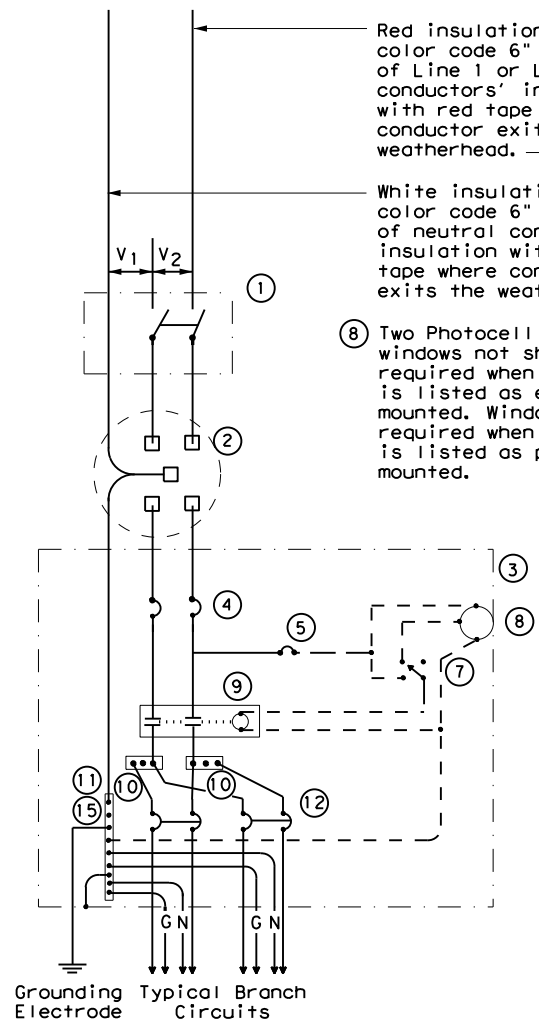
**ED(5) - 14**

FILE: ed5-14.dgn	DWG: TxDOT	CHK: TxDOT	DWG: TxDOT	CHK: TxDOT
© TxDOT October 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
	DIST	COUNTY	SHEET NO.	
	ATL	BOWIE	63	

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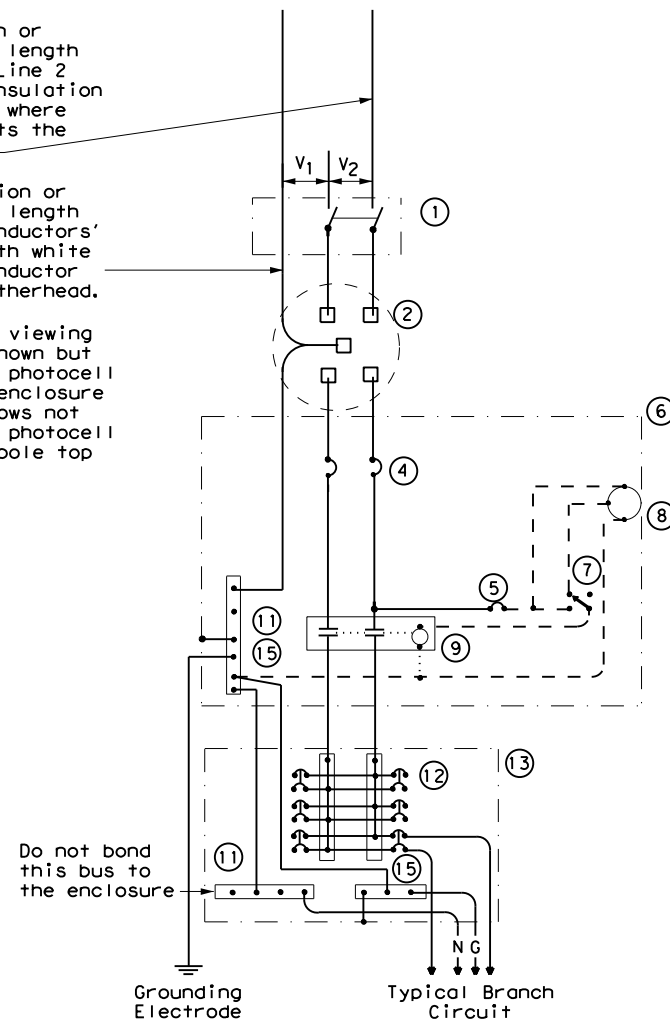


**SCHEMATIC TYPE A  
THREE WIRE**

Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

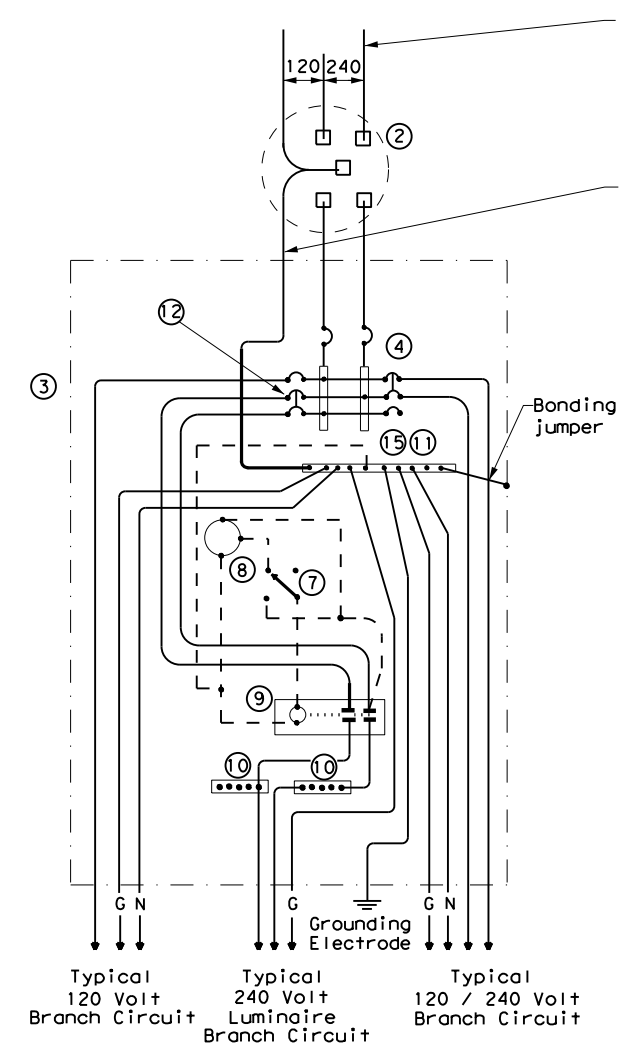
White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.

⑧ Two Photocell viewing windows not shown but required when photocell is listed as enclosure mounted. Windows not required when photocell is listed as pole top mounted.



**SCHEMATIC TYPE C  
THREE WIRE**

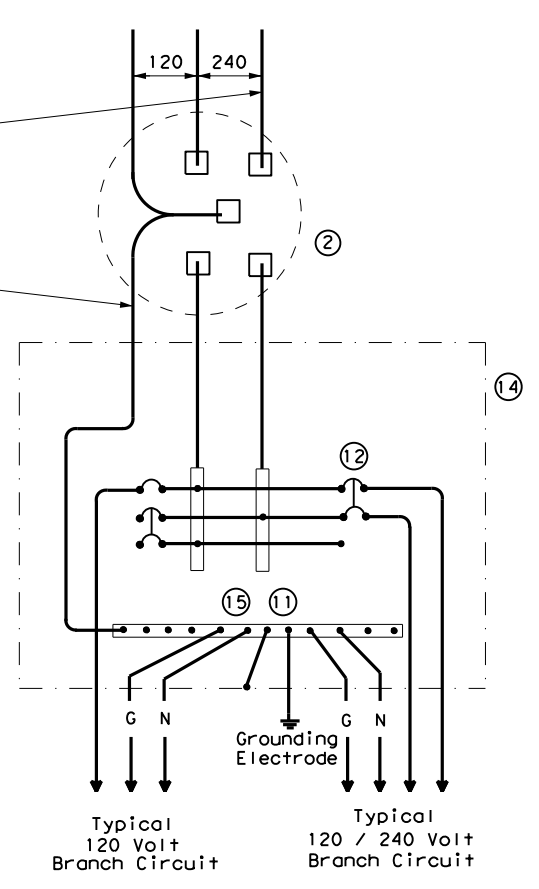
WIRING LEGEND	
—	Power Wiring
- - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required



**SCHEMATIC TYPE D - CUSTOM  
120/240 VOLTS - THREE WIRE**

Red insulation or color code 6" length of Line 1 or Line 2 conductors' insulation with red tape where conductor exits the weatherhead.

White insulation or color code 6" length of neutral conductors' insulation with white tape where conductor exits the weatherhead.



**SCHEMATIC TYPE T  
120/240 VOLTS - THREE WIRE**  
 Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

				Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES</b>					
<b>ED(6) - 14</b>					
FILE:	ed6-14.dgn	DN:	TxDOT	CK:	TxDOT
© TxDOT	October 2014	CONT:	0046	SECT:	06
REVISIONS		JOB:	082	HIGHWAY:	US 82
DIST:	ATL	COUNTY:	BOWIE	SHEET NO.:	64

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**SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)**

1. Provide steel pole and steel frame supports as per TxDOT Departmental Material Specification (DMS)11080 "Electrical Services." Mount all equipment and conduit on 12 gauge galvanized steel or stainless steel channel strut, 1 1/2 in. or 1 3/8 in. wide by 1 in. up to 3 3/4 in. deep Unistrut, Kindorf, B-line or equal. Bolt or weld all channel and hardware to vertical members as approved. Do not stack channel. File smooth and paint field cut ends of all channel with zinc-rich paint before installing.
2. Provide poles for overhead service with an eyebolt or similar fitting for attachment of the service drop to the pole in conformance with the electric utility provider's specifications.
3. Provide and install galvanized 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 in. of the exposed anchor bolt projecting above finished foundation. Provide and install leveling nuts for all anchor bolts.
4. Bond one of the anchor bolts to the rebar cage with 6 AWG bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. See Inset B.
5. Furnish and install rigid metallic ellis in all steel pole and steel frame foundations for all conduits entering the service from underground.
6. Use class C concrete for foundations. Ensure reinforcing steel is Grade 60 with 3" of unobstructed concrete cover.
7. Drill and tap steel poles and frames for 1/2 in. X 13 UNC tank ground fitting. For steel pole service supports, provide and install tank ground fitting 4 in. to 6 in. below electrical service enclosure. Provide properly sized hole through the bottom of the enclosure for the service grounding electrode conductor. Ensure electrical service grounding electrode conductor is as short and straight as possible from the enclosure to the tank ground fitting. For steel frame service supports, provide and install tank ground fitting on steel frame post. Install service grounding electrode conductor in a non-metallic conduit or tubing from the enclosure to the steel frame post. Connect electrical service grounding electrode conductor to the tank ground fitting. See steel frame and steel pole details and Inset A for more information. Size service entrance conduit and branch circuit conduit as shown in the plans. For underground conduit runs from the electrical service, extend RMC from the service enclosure to an RMC elbow, and then connect the schedule type and size of conduit shown in the plans. Provide and install grounding bushings where RMC terminates in the enclosure. Grounding bushings are not required when RMC is fitted into a sealing hub or threaded boss.
8. If Steel pole or frame is painted, bond each separate painted piece with a bonding jumper attached to a tapped hole.
9. Provide 1/4" - 20 machine screws for bonding. Do not use sheet metal screws. Remove all non-conductive material at contact points. Terminate bonding jumpers with listed devices. Install minimum size 6 AWG stranded copper bonding jumpers. Make up all threaded bonding connections wrench tight.
10. Avoid contact of the service drop and service entrance conductors with the metal pole to prevent abrasion of the insulated conductors.
11. Shop drawings are not required for service support structure unless specifically stated elsewhere or directed by the Engineer.

White insulation or color code 6" of neutral conductor's insulation with white tape where conductor exits weatherhead.

Red insulation or color code 6" length of Line 1 or Line 2 conductor's insulation with red tape where conductor exits the weatherhead. Conductor slack length, 12" min., 18" max.

2" to 6" 4" (typ.)

RMC

Service Enclosure

Inset A

Channel bracket or other arrangement approved by the Engineer. (Kindorf, Unistrut, B-line or equal.)

Inset A

Inset B

60" TYP.

2"

18" Min.

Class "C" concrete

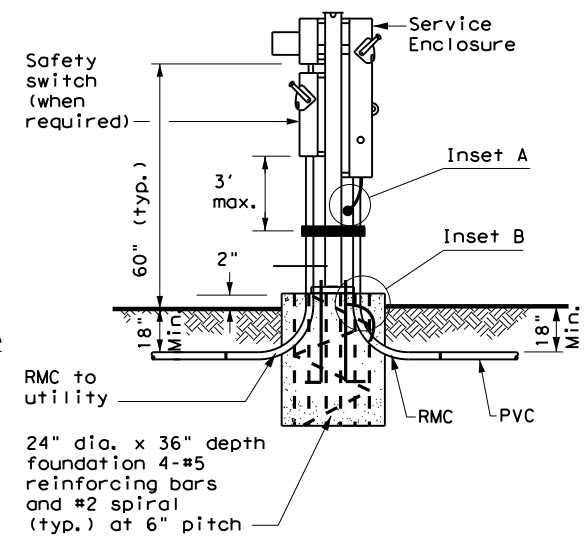
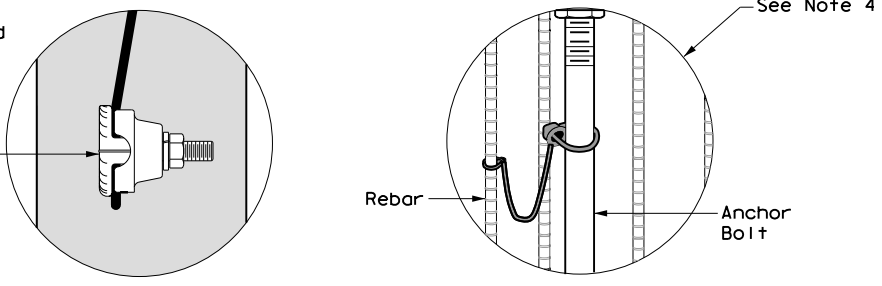
RMC

PVC

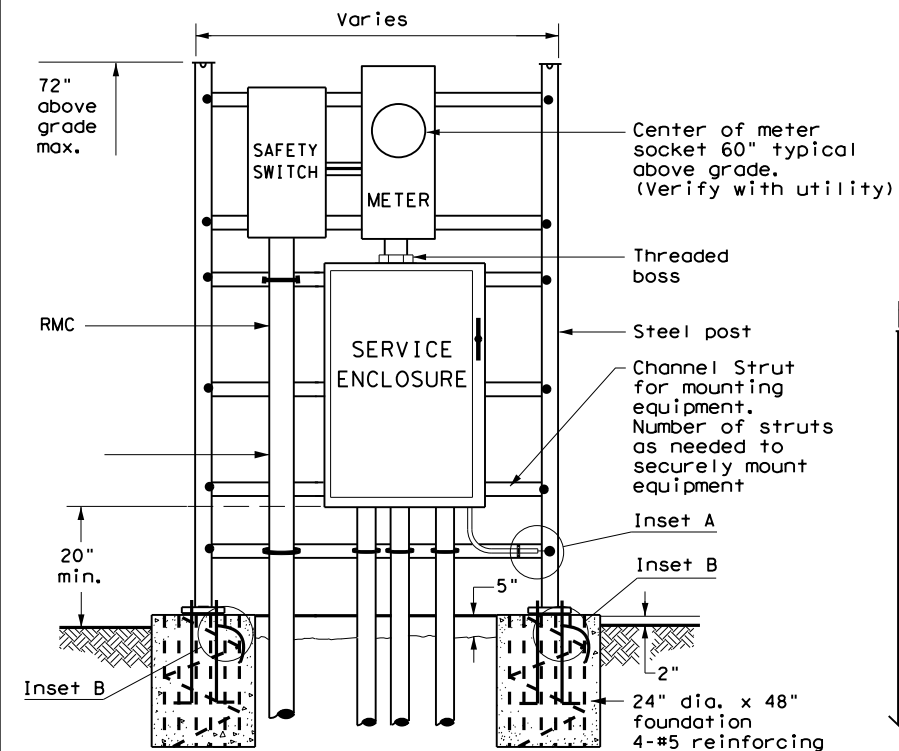
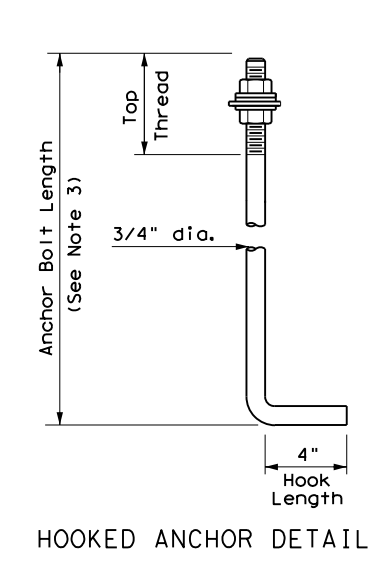
24 Dia. x 60" depth foundation 4-#5 reinforcing bars and #2 spiral (typ.) at 6" pitch

WITH SAFETY SWITCH  
WITHOUT SAFETY SWITCH  
**SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE**

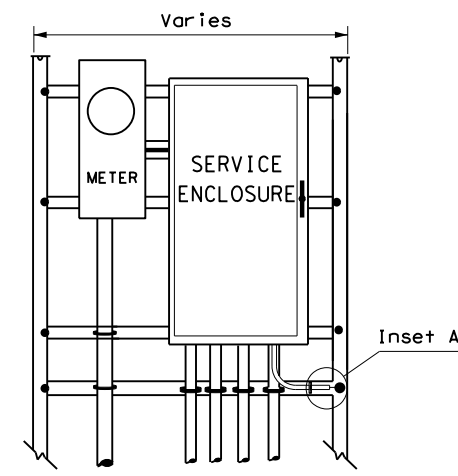
Drill, tap, and thread 1/2" X 13 UNC. Install tank ground fitting, connect electrical service grounding electrode conductor. See Note 7.



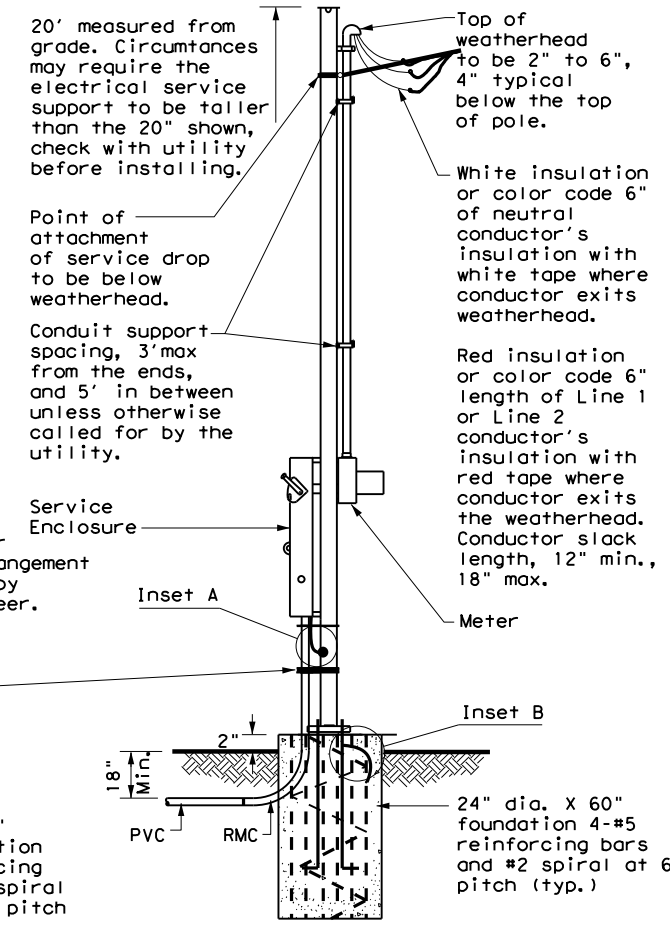
WITH SAFETY SWITCH  
**SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE**



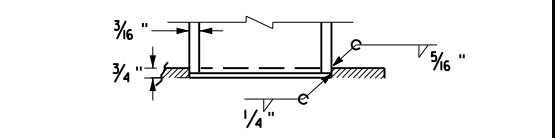
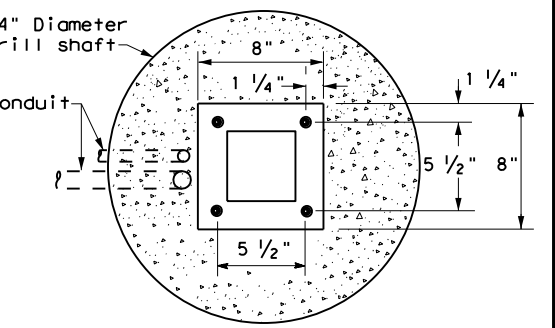
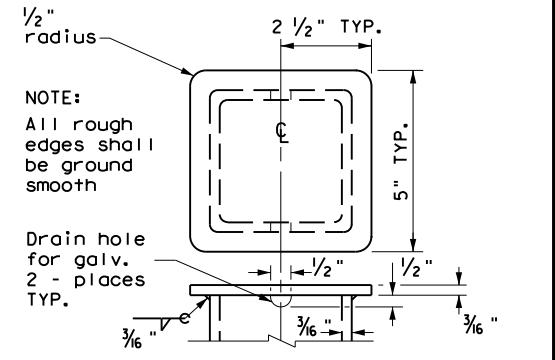
WITH SAFETY SWITCH  
**SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE**



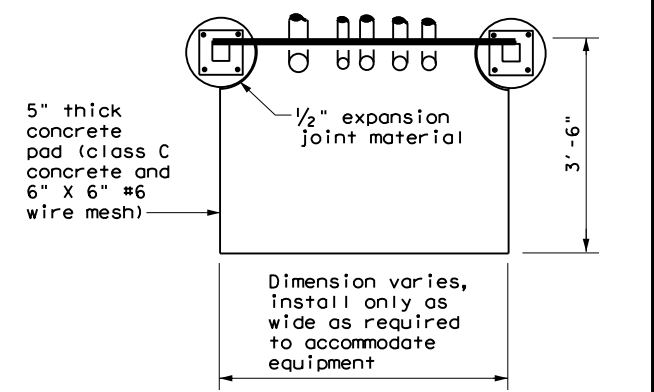
WITHOUT SAFETY SWITCH



WITH SAFETY SWITCH  
WITHOUT SAFETY SWITCH  
**SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE**



**SERVICE SUPPORT TYPE SF & SP**



**SERVICE SUPPORT TY SF (O) & SF (U)**

		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF &amp; SP ED(7)-14</b>			
FILE: ed7-14.dgn	DW: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT October 2014	CON: 0046	SECT: 06	JOB: 082
REVISIONS			US 82
	DIST: ATL	COUNTY: BOWIE	SHEET NO. 65





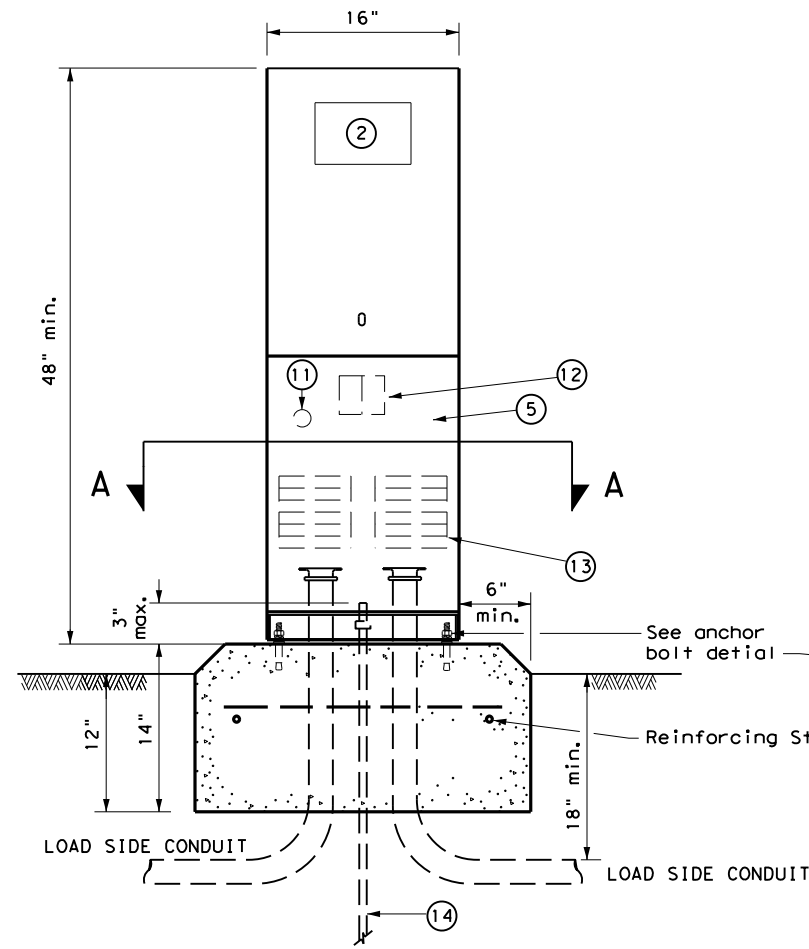


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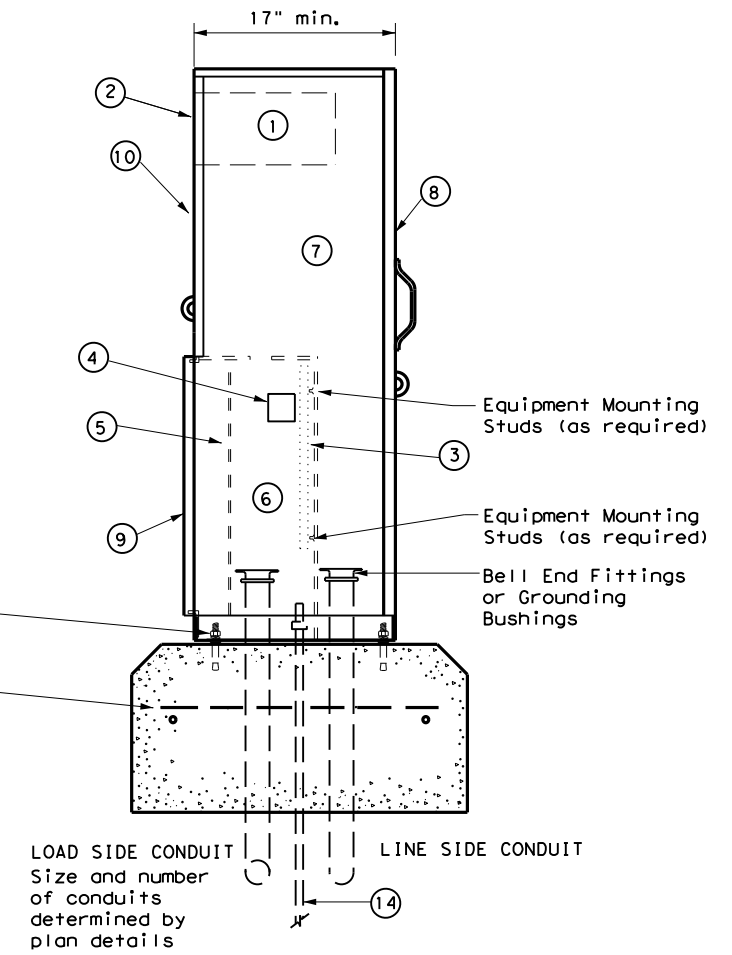
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**PEDESTAL SERVICE NOTES**

1. Manufacture pedestal electrical services in accordance with Departmental Material Specifications (DMS) 11080 "Electrical Services", 11085 "Electrical Services-Pedestal (PS)" and Item 628 "Electrical Services." Provide pedestal electrical services as listed on the Material Producers List (MPL) on the Department's web site under "Roadway Illumination and Electrical Supplies," Item 628. Ensure all mounting hardware and installation details of services meet utility company specifications. Contact the local utility company for approval of pedestal details prior to installing the electrical pedestal service. Submit any changes required by the utility company prior to manufacturing the pedestal enclosure.
2. When a meter socket is required, provide a socket with a minimum 100 amp rating that complies with local utility requirements.
3. Provide Class A or C concrete for pedestal service foundations in accordance with Item 420, "Concrete Substructures," except that concrete will not be paid for directly but is considered subsidiary to Item 628.
4. Provide #4 reinforcing steel for foundations in accordance with Item 440, "Reinforcement for Concrete."
5. Install 1/2 in. X 2 1/16 in. minimum length concrete single expansion type anchors for mounting pedestal enclosure to foundation. Anchor location to match mounting holes in each corner of enclosure. Secure each of the four corners of the pedestal enclosure to the anchors in the foundation with a 1/2 in. galvanized or stainless steel machine thread bolt, a properly sized locknut and a flat washer.
6. Finish top of concrete foundation in a neat and workmanlike manner. If leveling washers are used, ensure no more than 1/8 in. gap at any corner. Do not exceed a maximum dip or rise in the foundation of 1/8 in. per foot. When properly installed, ensure the top of the service enclosure is level front to back and side to side within 1/4 in. Repair rocking or movement of the service enclosure at no additional cost to the department.
7. Do not use liquidtight flexible metal conduit (LFMC) on pedestal type services.
8. Ensure all elbows in the foundation are sized as per utility provider's conduit requirements for underground conduit and feeders. PVC extensions may be installed provided the ends of the rigid metal conduits are more than 2 in. below the top of the concrete foundation. Where extension conduits are metal, grounding bushings must be installed with a bonding jumper properly terminated.

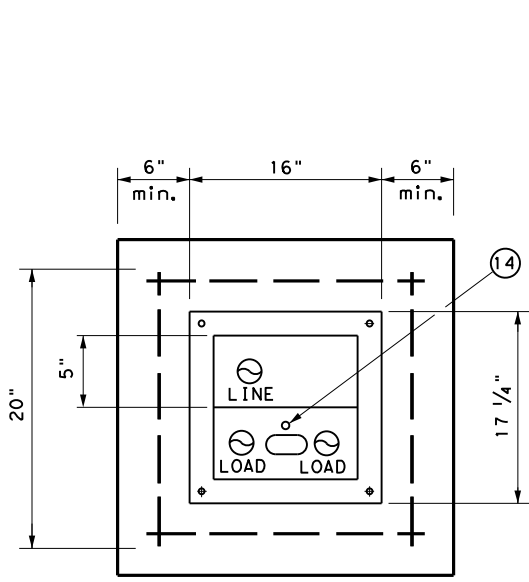


**FRONT VIEW**

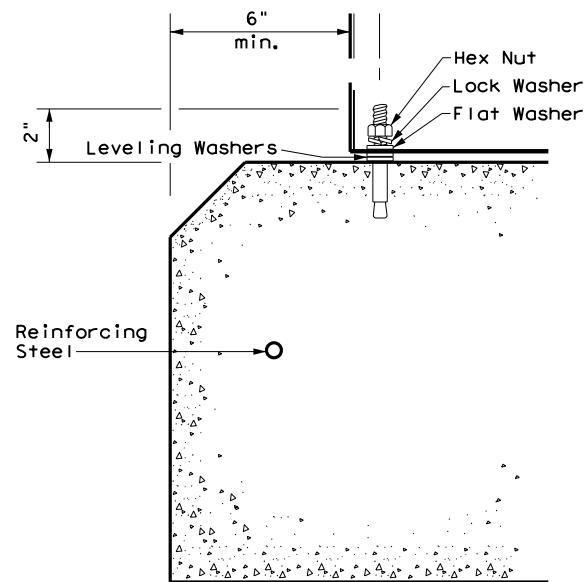


**SIDE VIEW**

TYPE C shown, TYPE A similar except that TYPE A shall have individual circuit breakers (CB) mounted on an equipment mounting panel. CB Handles shall protrude through hinged deadfront trim.



**SECTION A-A**



**ANCHOR BOLT DETAIL**

**LEGEND**

1	Meter Socket, (when required)
2	Meter Socket Window, (when required)
3	Equipment Mounting Panel
4	Photo Electric Control Window, (When required)
5	Hinged Deadfront Trim
6	Load Side Conduit Trim
7	Line Side Conduit Area
8	Utility Access Door, with handle
9	Pedestal Door
10	Hinged Meter Access
11	Control Station (H-O-A Switch)
12	Main Disconnect
13	Branch Circuit Breakers
14	Copper Clad Ground Rod - 5/8" X 10'

		Traffic Operations Division Standard	
<b>ELECTRICAL DETAILS          ELECTRICAL SERVICE SUPPORT          PEDESTAL SERVICE TYPE PS</b>			
<b>ED(9) - 14</b>			
FILE: ed9-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT October 2014	CONT: 0046	SECT: 06	JOB: US 82
REVISIONS	DIST: ATL	COUNTY: BOWIE	SHEET NO.: 67

# ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.
2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.
4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.
5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.
  - a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.
  - b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25' above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25' above the surrounding terrain, provide poles meeting the following requirements:
    - i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).
    - ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer's name, and logo on shop drawings. Include on manufacturer's shop drawings the ASTM designations for all materials to be used.
6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.
7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.
8. Install T-Base with following procedure:
  - a. Anchor Bolt Tightening.
    - i. Coat the threads of the anchor bolts with electrically conductive lubricant.
    - ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.
    - iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.
    - iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.
    - v. Check top of T-base for level. If not level then foundation must be leveled.
  - b. Top Bolt Procedure
    - i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

- ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."
- iii. Tighten each nut to 150 ft-lb. using a torque wrench.

c. Level and Plumb

- i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

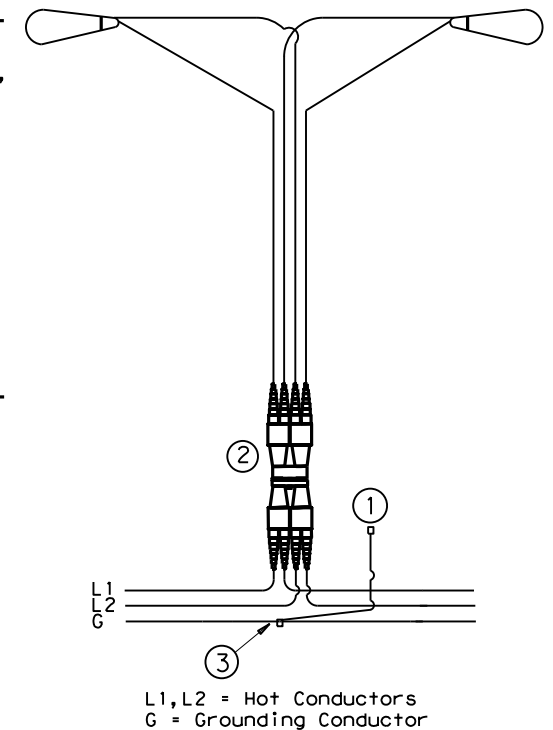
9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).
10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.
11. Mount luminaires on arms level as shown by the luminaire level indicator.
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

### Wiring Diagram Notes:

- ① Use 1/2 in. -13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.
- ② Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.
- ③ Split Bolt or other connector.

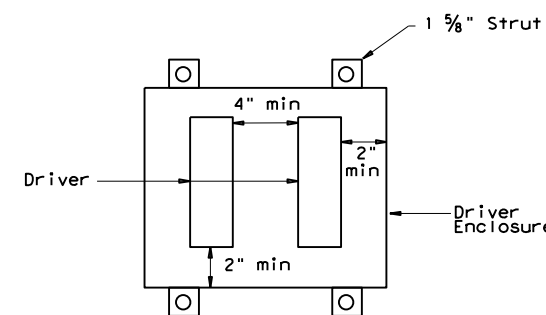
### Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):
  - a. Provide NEMA 3R outdoor enclosure or as approved.
  - b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.
  - c. Install drivers with at least 2 inches of space from enclosure walls.
  - d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment
  - e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.
  - f. Provide remote drivers with a maximum of 100 watts
  - g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



### TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.



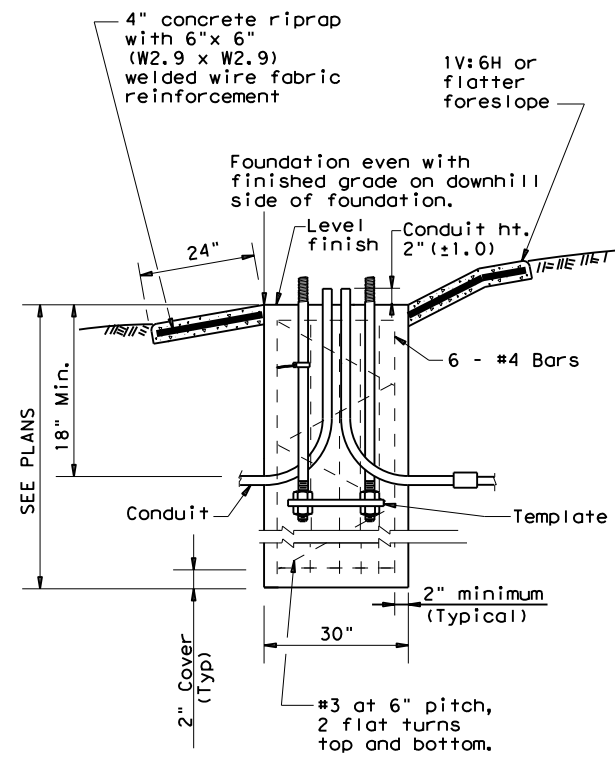
Driver Spacing In Remote Enclosure

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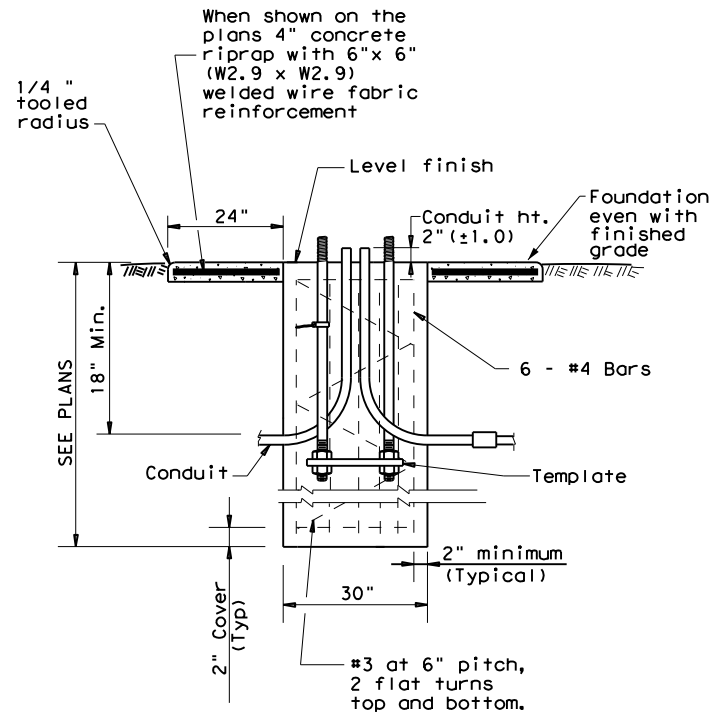
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© TxDOT January 2007		CONT 0046	SECT 06
REVISIONS		JOB 082	HIGHWAY US 82
7-17	DIST ATL	COUNTY BOWIE	SHEET NO. 68

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**SECTION A-A**  
SHOWING SLOPED GRADE



**SECTION A-A**  
SHOWING CONSTANT GRADE

**TABLE 1**

**ANCHOR BOLTS**

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1 in. x 30 in.
40-50 ft.	15 in.	17 1/4 in.	1 1/4 in. x 30 in.

**TABLE 2**

**RECOMMENDED FOUNDATION LENGTHS (See note 1)**

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6'	6'	6'
>20 ft. to 30 ft.	8'	6'	6'
>30 ft. to 40 ft.	8'	8'	6'
>40 ft. to 50 ft.	10'	8'	6'

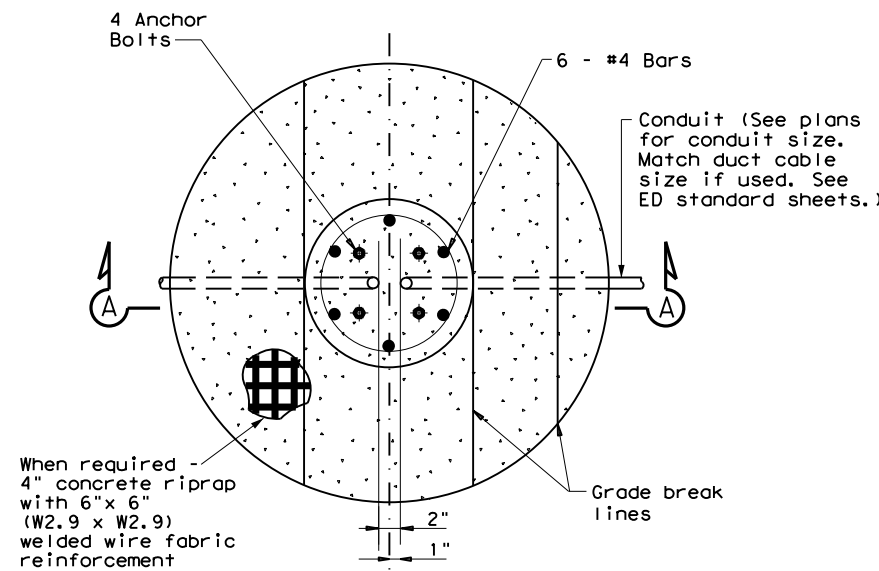
**TABLE 3**

**PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)**

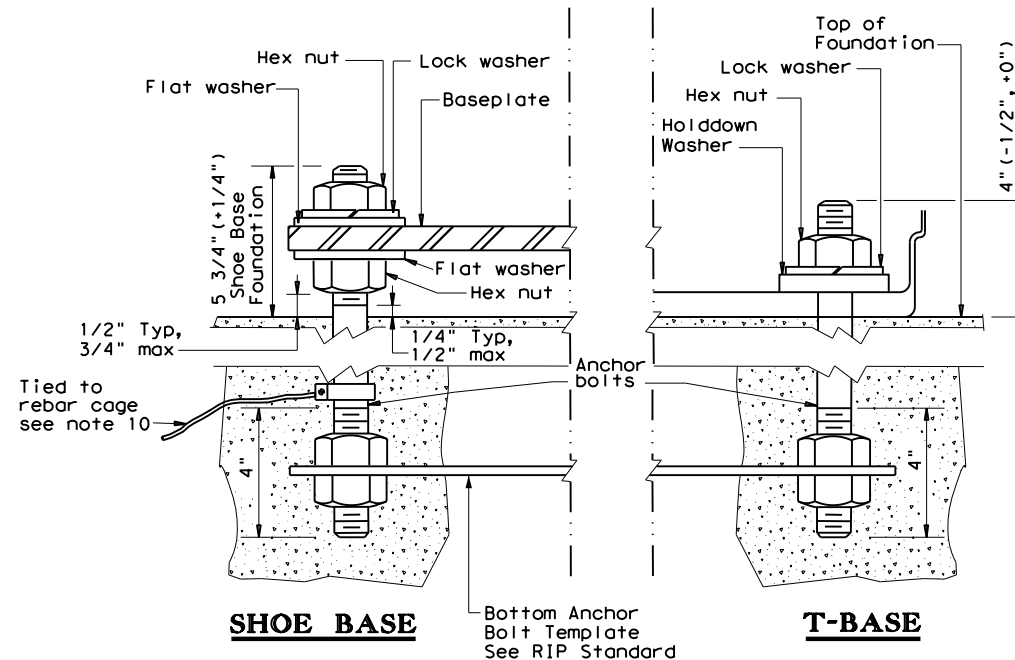
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

**GENERAL NOTES:**

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



**FOUNDATION DETAIL**



**ANCHOR BOLT DETAIL**

**TABLE 4**

**BREAKAWAY POLE PLACEMENT (See note 6)**

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

\* or as close to ROW line as is practical  
 \*\* provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

Texas Department of Transportation  
 Traffic Safety Division Standard

**ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)**  
**RID(2)-20**

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©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
1-11	DIST	COUNTY	SHEET NO.	
7-17	ATL	BOWIE	69	
12-20				

### SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base					T-Base					CSB/SSCB Mounted					
	Designation				Quantity	Designation				Quantity	Designation				Quantity	
	Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire		Pole	A1	A2	Luminaire		
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED							
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED							
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED			(Type SP 28 S - 4)	(250W EQ) LED			
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED			(Type SP 28 S - 4 - 4)	(250W EQ) LED			
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED			(Type SP 28 S - 8)	(250W EQ) LED			
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED			(Type SP 28 S - 8 - 8)	(250W EQ) LED			
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED			(Type SP 38 S - 4)	(250W EQ) LED			
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED			(Type SP 38 S - 4 - 4)	(250W EQ) LED			
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED			(Type SP 38 S - 8)	(250W EQ) LED			
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED			(Type SP 38 S - 8 - 8)	(250W EQ) LED			
	(Type SA 40 S - 10)			(250W EQ) LED		(Type SA 40 T - 10)			(250W EQ) LED			(Type SP 38 S - 10)	(250W EQ) LED			
	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED			(Type SP 38 S - 10 - 10)	(250W EQ) LED			
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED			(Type SP 38 S - 12)	(250W EQ) LED			
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED			(Type SP 38 S - 12 - 12)	(250W EQ) LED			
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED			(Type SP 48 S - 4)	(400W EQ) LED			
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	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED			(Type SP 48 S - 8)	(400W EQ) LED			
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED			(Type SP 48 S - 8 - 8)	(400W EQ) LED			
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED	2		(Type SP 48 S - 10)	(400W EQ) LED			
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	(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED			(Type SP 48 S - 12)	(400W EQ) LED			
	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED			(Type SP 48 S - 12 - 12)	(400W EQ) LED			

OTHER				
Designation				Quantity
Pole	A1	A2	Luminaire	

**GENERAL NOTES:**

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.
2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.
3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.
4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.
  - a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
  - b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
  - c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
  - d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.
5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.
  - a. Meet all of the requirements stated above for optional steel pole designs and the following:
    1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
    2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
    3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
    4. Pole components shall be constructed using the following material:
      - Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
      - Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
      - Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
      - Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
      - Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
      - Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.
6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.
7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

**EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS**

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.  
 ST: Pole and mast arm must be steel.  
 AL: Pole and mast arm must be aluminum.  
 SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.  
 Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.  
 Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

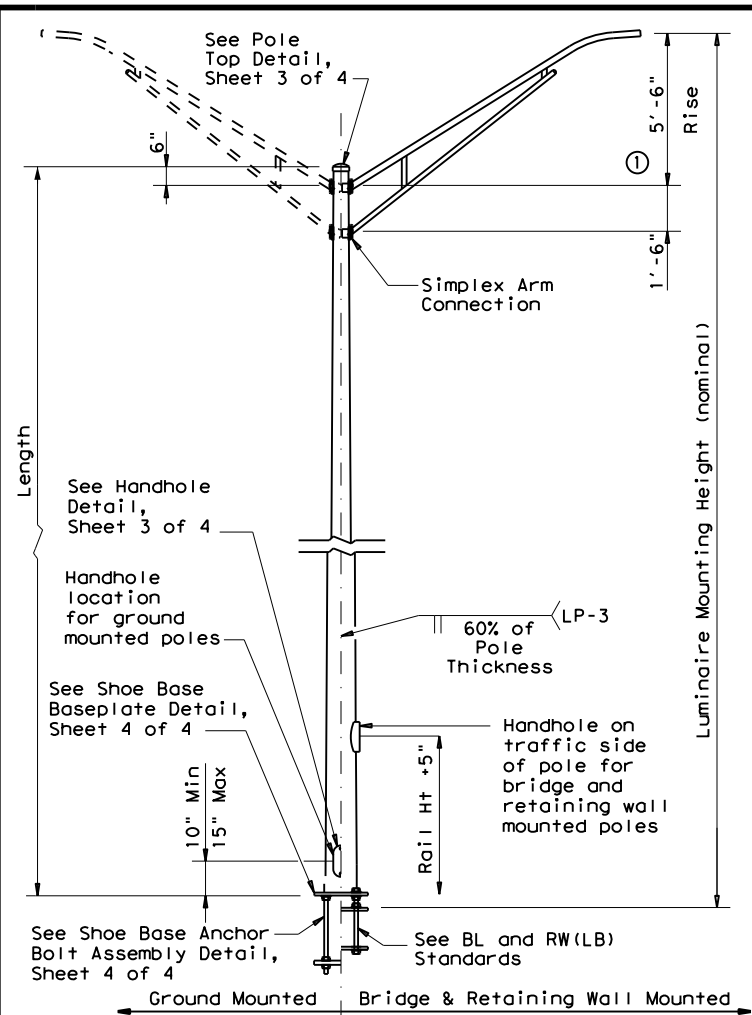
Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

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				Traffic Safety Division Standard	
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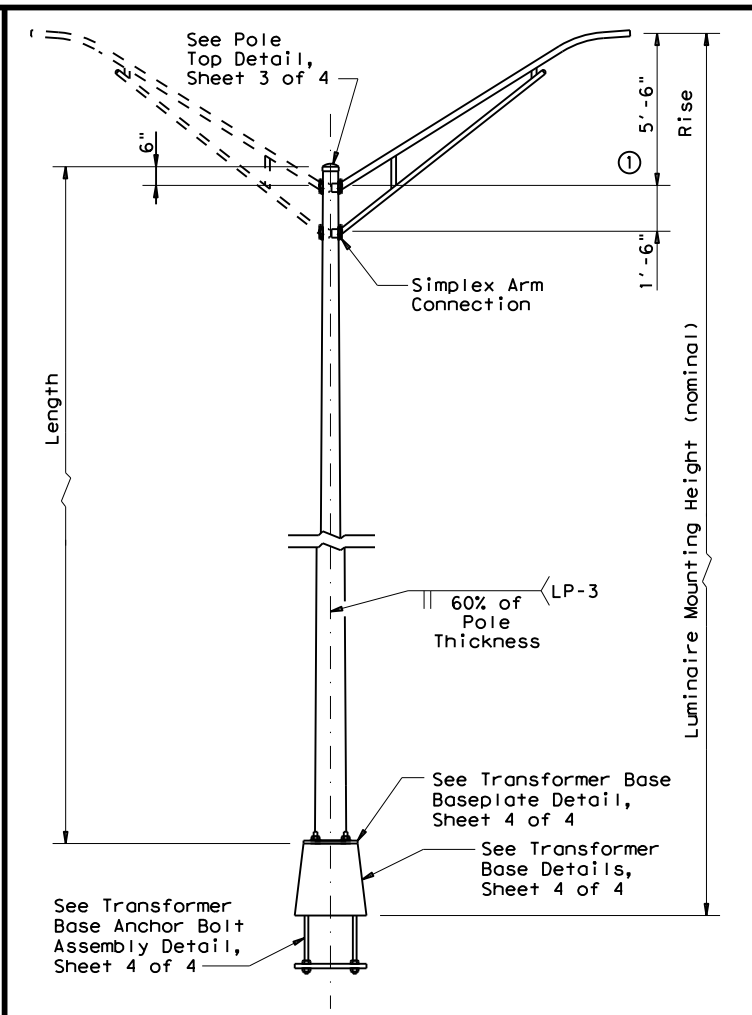
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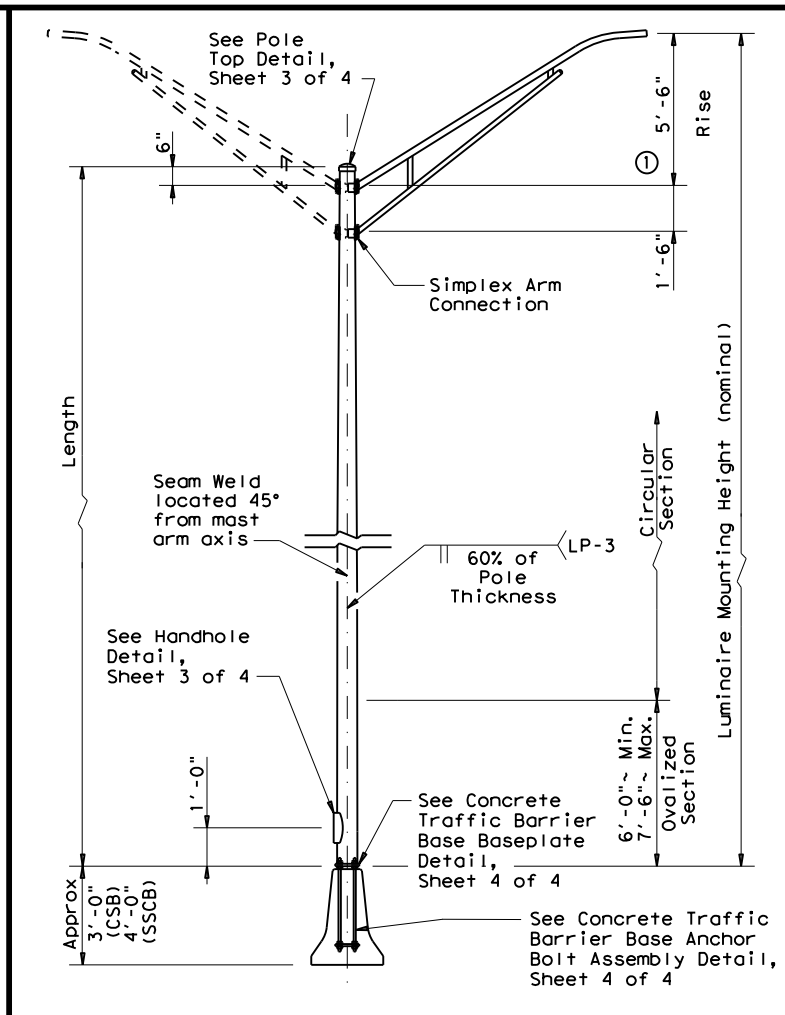
**SHOE BASE POLE**

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3



**TRANSFORMER BASE POLE**

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3



**CONCRETE TRAFFIC BARRIER BASE POLE**

Luminaire Mounting Height (Nominal) (ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)	
					About C of Rail	Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

**GENERAL NOTES:**

- Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminares, and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.
- Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.
- Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
- For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.
- Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."
- Steel poles shall be fabricated in accordance with Item 441, "Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.
- Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.
- Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.
- Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."
- All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.
- The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."
- Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.
- Erect transformer base poles in accordance with sheet RID(1).

**MATERIAL DATA**

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 ③, or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H, or A563 Gr DH	
Flat Washers	F436	

**NOTES:**

- 2'-6" rise for 4 ft. luminaire arms.
- Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.
- A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

**POLE ASSEMBLY FABRICATION TOLERANCES TABLE**

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

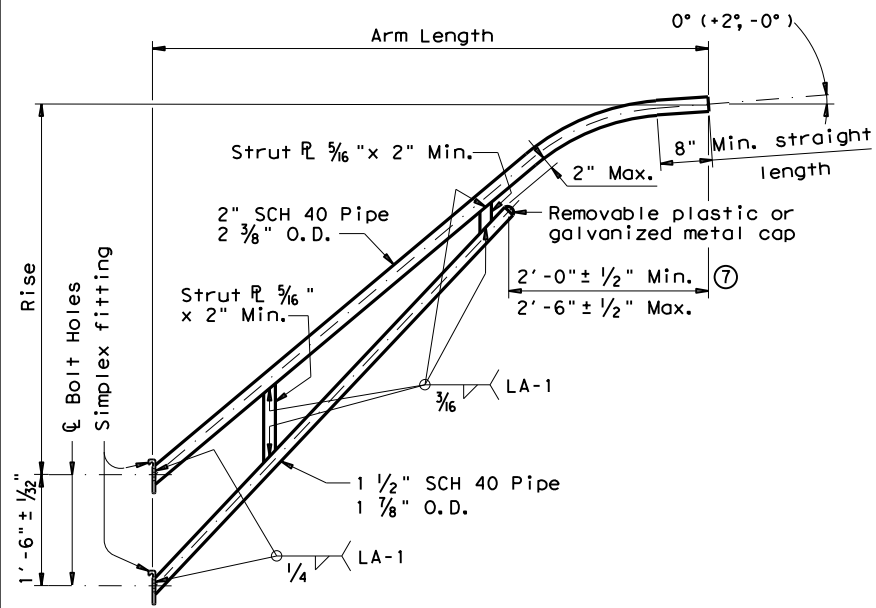


**ROADWAY ILLUMINATION POLES  
RIP(2) - 19**

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
7-17	DIST	COUNTY	SHEET NO.	
12-19	ATL	BOWIE	71	

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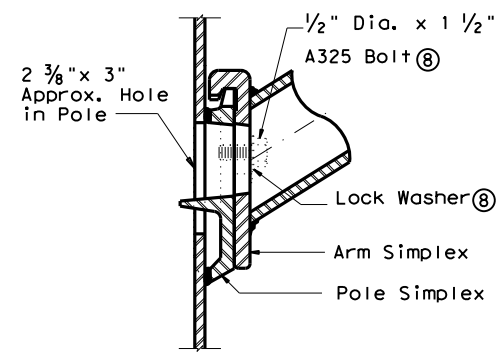
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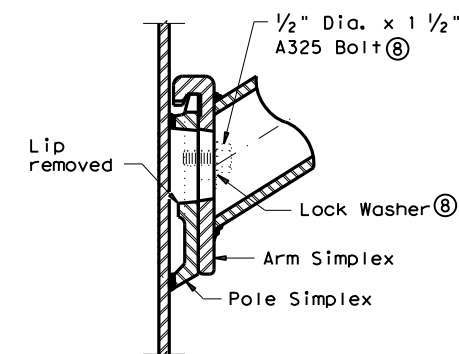
LUMINAIRE ARM

LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

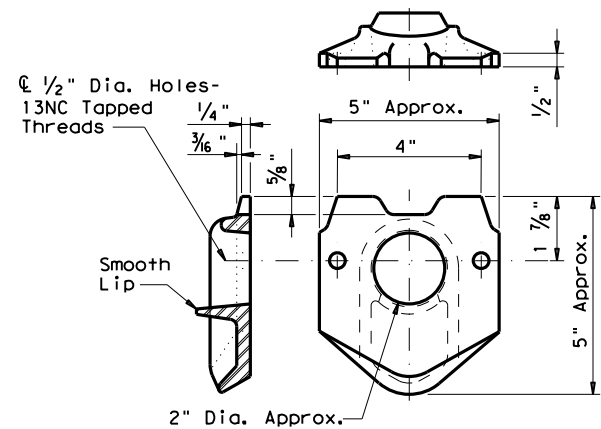


UPPER SIMPLEX FITTING  
(Gusset not shown for clarity)

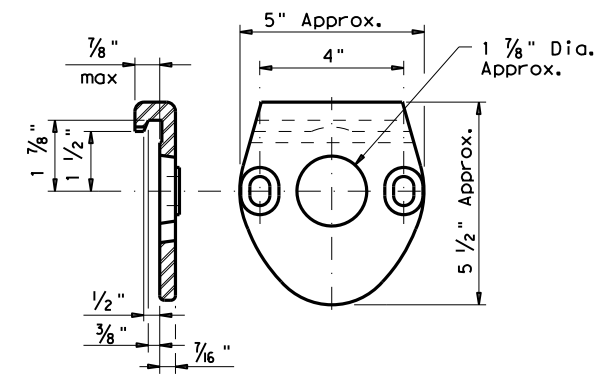


LOWER SIMPLEX FITTING  
(Gusset not shown for clarity)

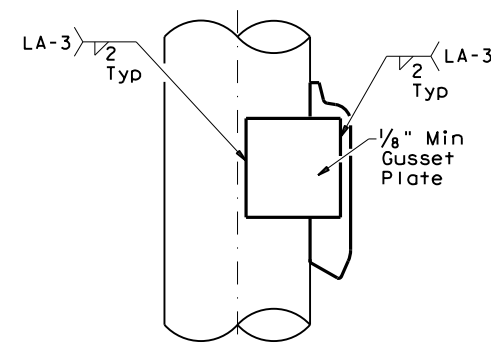
SECTION B-B



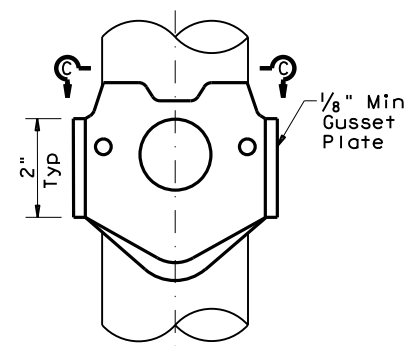
POLE SIMPLEX DETAIL



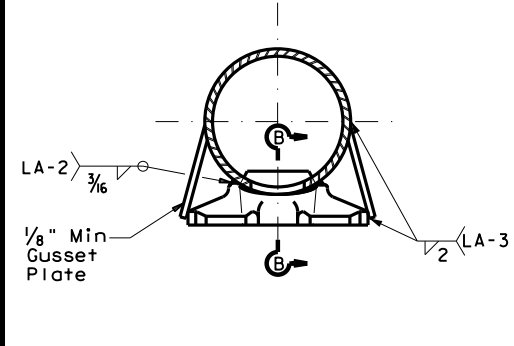
ARM SIMPLEX DETAIL



SIDE

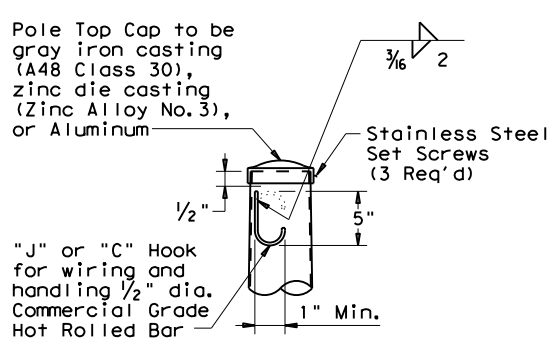


ELEVATION

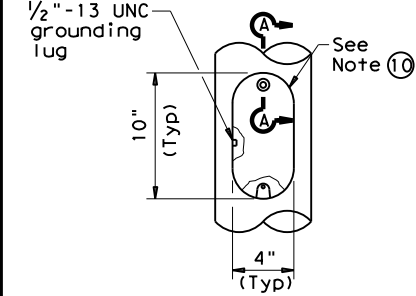


SECTION C-C

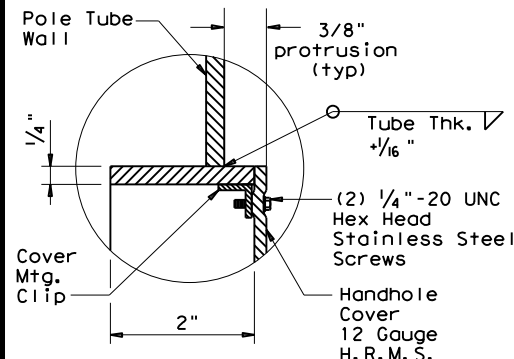
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

NOTES:

- ④ Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ⑤ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ⑥ A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.
- ⑦ Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- ⑧ Each pole simplex fitting shall be supplied with 2 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans.
- ⑨ Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.
- ⑩ A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS

Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 ⑤, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 ⑥, or A1011 HSLAS-F Gr 50 ⑥
Arm Struts and Gusset Plates ④	ASTM A36, A572 Gr 50 ⑥, or A588
Misc.	ASTM designations as noted

SHEET 3 OF 4

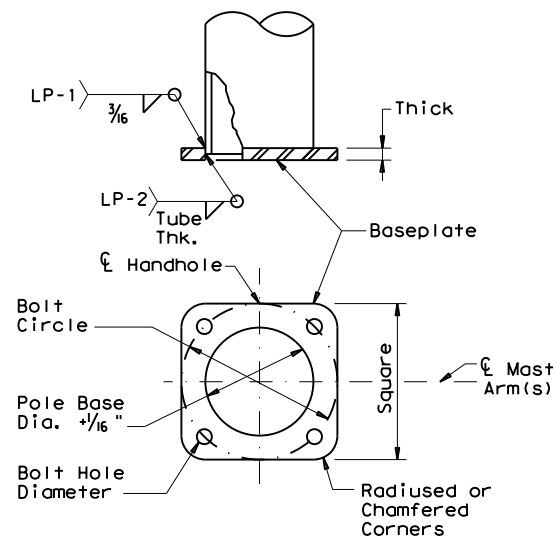


ROADWAY ILLUMINATION POLES  
 RIP(3) - 19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
© TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
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12-19	ATL	BOWIE	72	

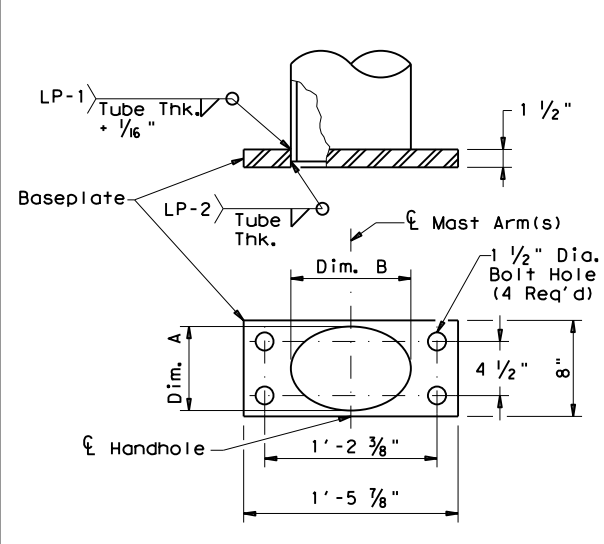
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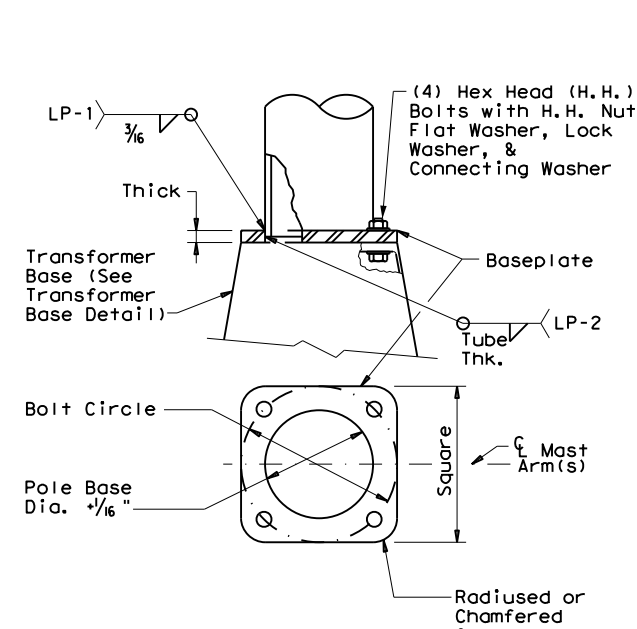
**SHOE BASE BASEPLATE**

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20' - 39'	13"	13"	1 1/4"	1 1/4"
40'	15"	15"	1 1/4"	1 1/2"
50'	15"	15"	1 1/2"	1 1/2"



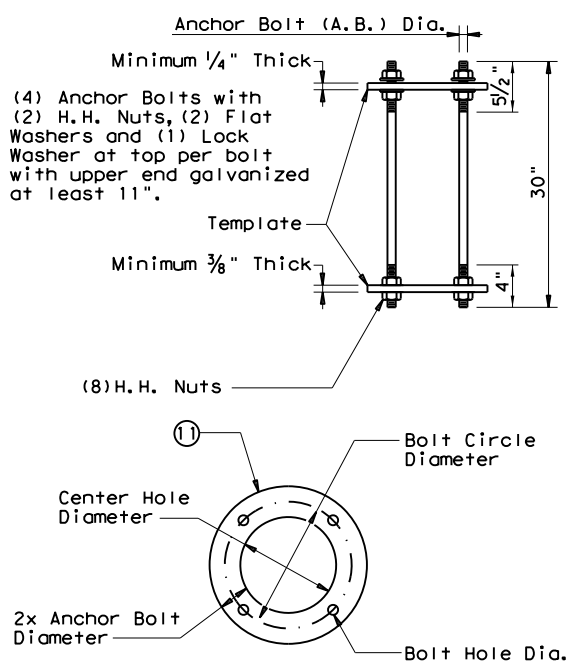
**CONCRETE TRAFFIC BARRIER BASE BASEPLATE**

CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (1)	DIM. A	DIM. B
28' - 38'	9"	7" ± 1/4"	10" ± 1/4"
48'	10 1/2"	7" ± 1/4"	13" ± 1/4"



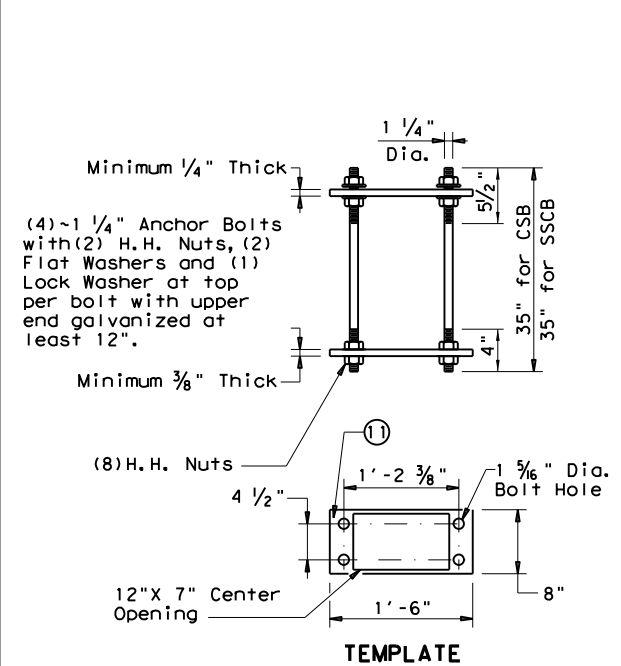
**TRANSFORMER BASE BASEPLATE**

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20' - 39'	13"	13"	1 1/4"	1"	1 1/4"	A
40'	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50'	15"	15"	1 1/2"	1 1/4"	1 1/2"	B



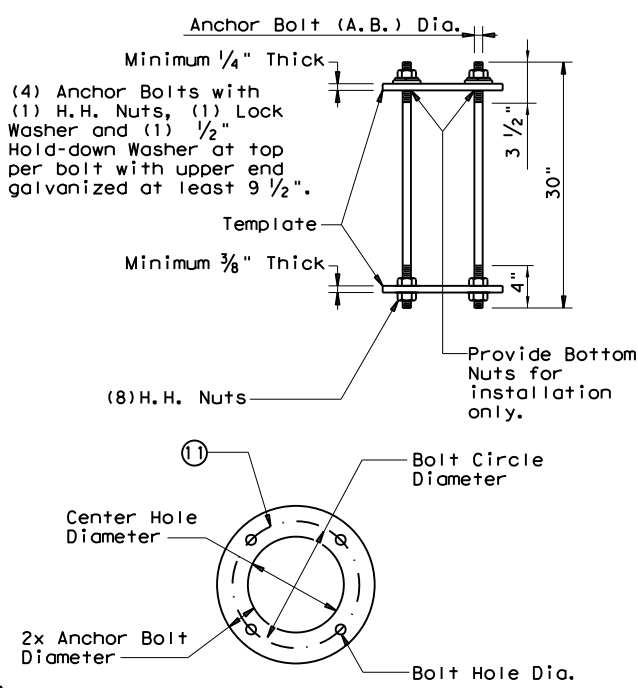
**SHOE BASE ANCHOR BOLT ASSEMBLY**

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	13"	11"	1 1/16"
40' - 50'	1 1/4"	15"	12 1/2"	1 5/16"



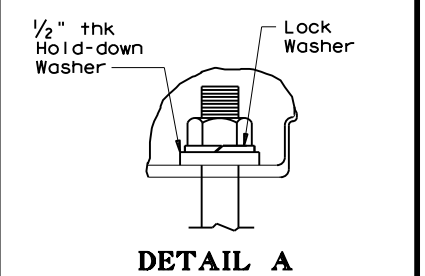
**CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY**

CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20' - 39'	1"	14"	12"	1 1/16"
40' - 50'	1 1/4"	17 1/4"	14 3/4"	1 5/16"

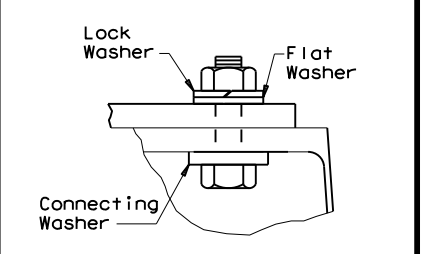


**TRANSFORMER BASE ANCHOR BOLT ASSEMBLY**

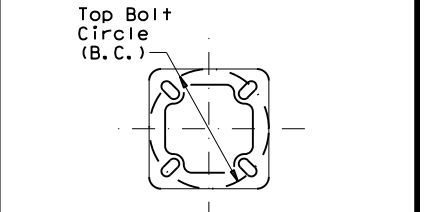
TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



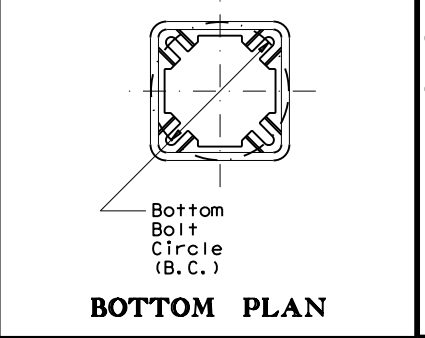
**DETAIL A**



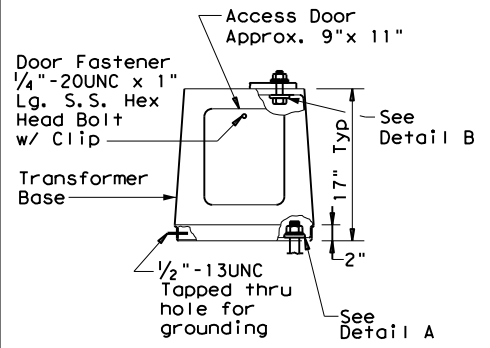
**DETAIL B**



**TOP PLAN**



**BOTTOM PLAN**



**ELEVATION**

**TRANSFORMER BASE DETAILS**

**GENERAL NOTES:**

- For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
- All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
- Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers, and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
- Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
- Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

**NOTES:**

- Anchor Bolt Templates do not need to be galvanized.
- Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"

SHEET 4 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

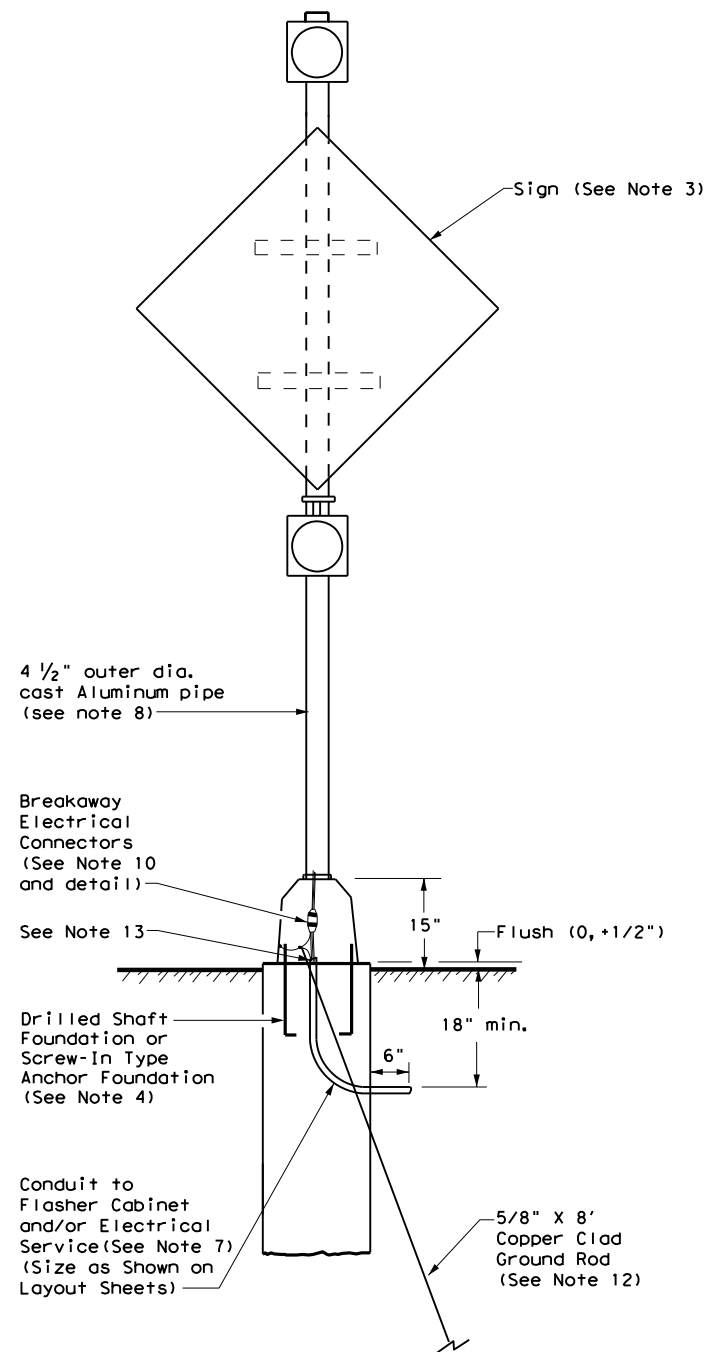
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©TxDOT January 2007	CONT SECT	JOB HIGHWAY
REVISIONS	0046 06	082 US 82
7-17	DIST COUNTY	SHEET NO.
12-19	ATL BOWIE	73



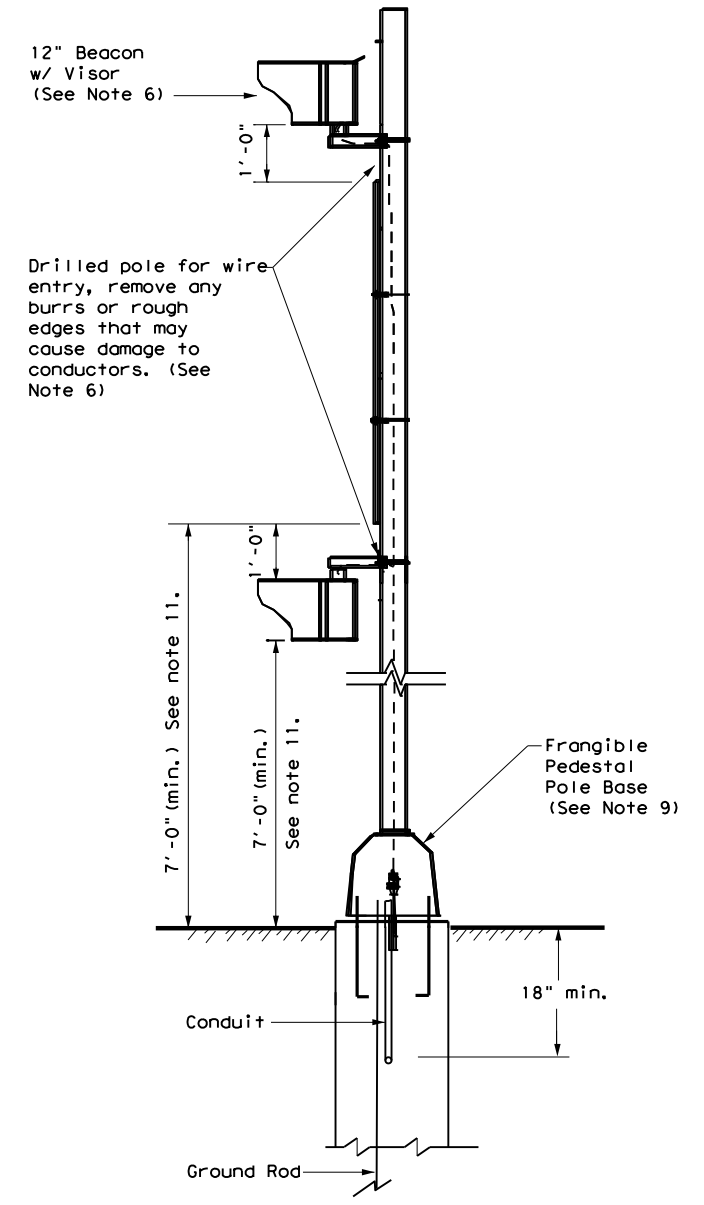
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**GENERAL NOTES:**

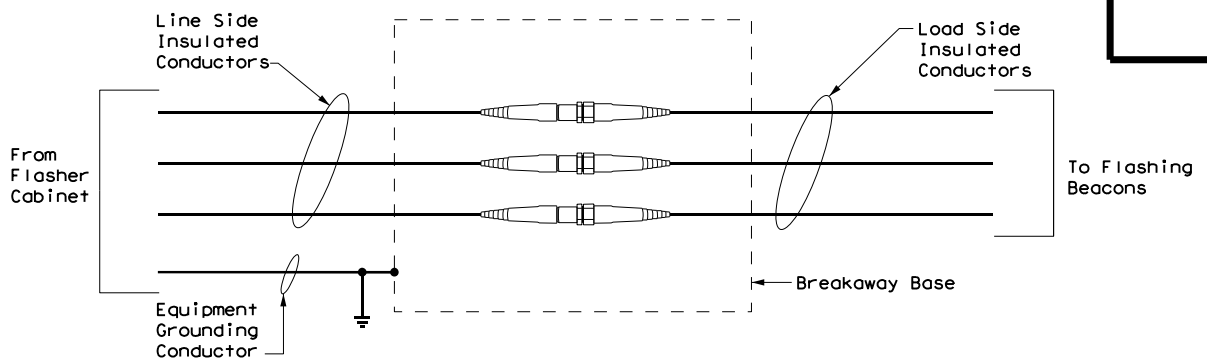
- Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
- See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
- See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
- Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
- When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
- Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
- Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
- Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
- Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening of connection.
- Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug. For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
- Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
- Make connections to ground rods according to NEC. Ground rod clamps shall be listed for their intended purpose.
- Ensure height of conduit and ground rod is below top of anchor bolts.



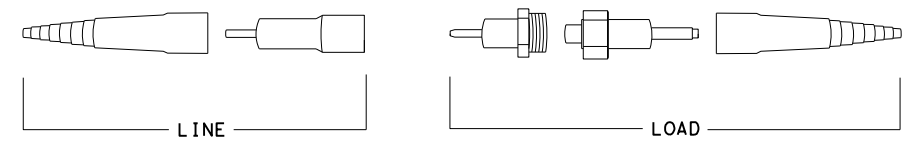
**FRONT**



**SIDE**



**NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS**



**NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS  
EXPLODED VIEW**

Texas Department of Transportation

Traffic Operations Division Standard

## ROADSIDE FLASHING BEACON ASSEMBLY

### RFBA-13

FILE: rfb-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT
© TxDOT January 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0046	06	082	US 82
5-93 12-04	DIST	COUNTY	SHEET NO.	
10-93 3-13	ATL	BOWIE	74	
4-98				



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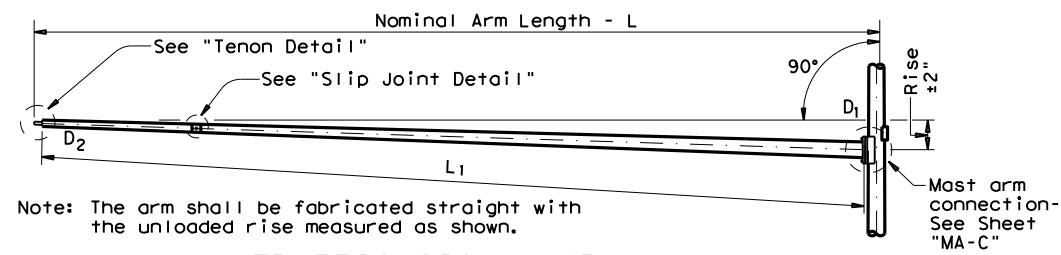
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Arm Length	ROUND POLES					POLYGONAL POLES					Foundation Type
	D <sub>B</sub>	D <sub>19</sub>	D <sub>24</sub>	D <sub>30</sub>	① thk	D <sub>B</sub>	D <sub>19</sub>	D <sub>24</sub>	D <sub>30</sub>	① thk	
ft.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
20	10.5	7.8	7.1	6.3	.179	11.5	8.5	7.7	6.8	.179	30-A
24	11.0	8.3	7.6	6.8	.179	12.0	9.0	8.2	7.3	.179	30-A
28	11.5	8.8	8.1	7.3	.179	12.5	9.5	8.7	7.8	.179	30-A
32	12.5	9.8	9.1	8.3	.179	12.0	9.0	8.2	7.3	.239	30-A
36	12.0	9.3	8.6	7.8	.239	12.5	9.5	8.7	7.8	.239	36-A
40	12.0	9.3	8.6	7.8	.239	13.5	10.5	9.7	8.8	.239	36-A
44	12.5	9.8	9.1	8.3	.239	14.0	11.0	10.2	9.3	.239	36-A
48	13.0	10.3	9.6	8.8	.239	15.0	12.0	11.2	10.3	.239	36-A

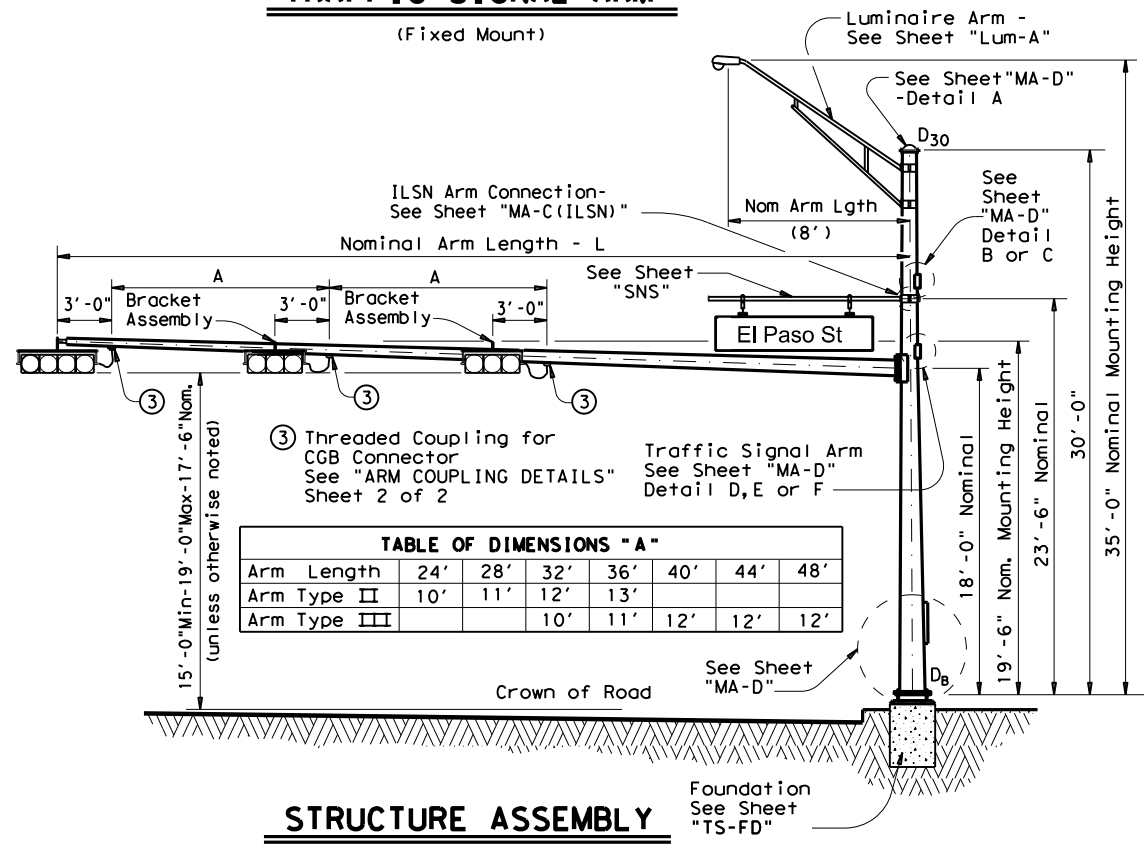
Arm Length	ROUND ARMS					POLYGONAL ARMS				
	L <sub>1</sub>	D <sub>1</sub>	D <sub>2</sub>	① thk	Rise	L <sub>1</sub>	D <sub>1</sub>	② D <sub>2</sub>	① thk	Rise
ft.	ft.	in.	in.	in.		ft.	in.	in.	in.	
20	19.1	6.5	3.8	.179	1'-9"	19.1	7.0	3.5	.179	1'-8"
24	23.1	7.5	4.3	.179	1'-10"	23.1	7.5	3.5	.179	1'-9"
28	27.1	8.0	4.2	.179	1'-11"	27.1	8.0	3.5	.179	1'-10"
32	31.0	9.0	4.7	.179	2'-1"	31.0	9.0	3.5	.179	2'-0"
36	35.0	9.5	4.6	.179	2'-4"	35.0	10.0	3.5	.179	2'-1"
40	39.0	9.5	4.1	.239	2'-8"	39.0	9.5	3.5	.239	2'-3"
44	43.0	10.0	4.1	.239	2'-11"	43.0	10.0	3.5	.239	2'-6"
48	47.0	10.5	4.1	.239	3'-4"	47.0	11.0	3.5	.239	2'-9"

D<sub>B</sub> = Pole Base O.D.  
 D<sub>19</sub> = Pole Top O.D. with no Luminaire and no ILSN  
 D<sub>24</sub> = Pole Top O.D. with ILSN w/out Luminaire  
 D<sub>30</sub> = Pole Top O.D. with Luminaire  
 D<sub>1</sub> = Arm Base O.D.  
 D<sub>2</sub> = Arm End O.D.  
 L<sub>1</sub> = Shaft Length  
 L = Nominal Arm Length

- ① Thickness shown are minimums, thicker materials may be used.
- ② D<sub>2</sub> may be increased by up to 1" for polygonal arms.



**TRAFFIC SIGNAL ARM**  
(Fixed Mount)



Arm Length	24'	28'	32'	36'	40'	44'	48'
Arm Type II	10'	11'	12'	13'			
Arm Type III			10'	11'	12'	12'	12'

**SHIPPING PARTS LIST**

Ship each pole with the following attached: enlarged hand hole, pole cap, fixed-arm connection bolts and washers and any additional hardware listed in the table.

Nominal Arm Length	30' Poles With Luminaire		24' Poles With ILSN		19' Poles With No Luminaire and No ILSN	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
ft	20L-80		20S-80		20-80	
24	24L-80		24S-80		24-80	
28	28L-80		28S-80		28-80	2
32	32L-80		32S-80		32-80	1
36	36L-80		36S-80		36-80	1
40	40L-80		40S-80		40-80	
44	44L-80		44S-80		44-80	
48	48L-80		48S-80		48-80	1

Traffic Signal Arms (1 per Pole) Ship each arm with the listed equipment attached

Nominal Arm Length	Type I Arm (1 Signal)		Type II Arm (2 Signals)		Type III Arm (3 Signals)	
	Designation	Quantity	Designation	Quantity	Designation	Quantity
ft	20I-80					
24	24I-80		24II-80			
28	28I-80		28II-80	2		
32			32II-80	1	32III-80	
36			36II-80	1	36III-80	
40					40III-80	
44					44III-80	
48				1	48III-80	

Luminaire Arms (1 per 30' pole)

Nominal Arm Length	Quantity
8' Arm	

ILSN Arm (Max. 2 per pole) Ship with clamps, bolts and washers

Nominal Arm Length	Quantity
7' Arm	
9' Arm	

Anchor Bolt Assemblies (1 per pole)

Anchor Bolt Diameter	Anchor Bolt Length	Quantity
1 1/2"	3'-4"	3
1 3/4"	3'-10"	2

Each anchor bolt assembly consists of the following: Top and Bottom templates, 4 anchor bolts, 8 nuts, 8 flat washers, and 4 nut anchor devices (Type 2) per Standard Drawing "TS-FD".

Templates may be removed for shipment.

**Texas Department of Transportation**  
Traffic Operations Division

**TRAFFIC SIGNAL SUPPORT STRUCTURES**

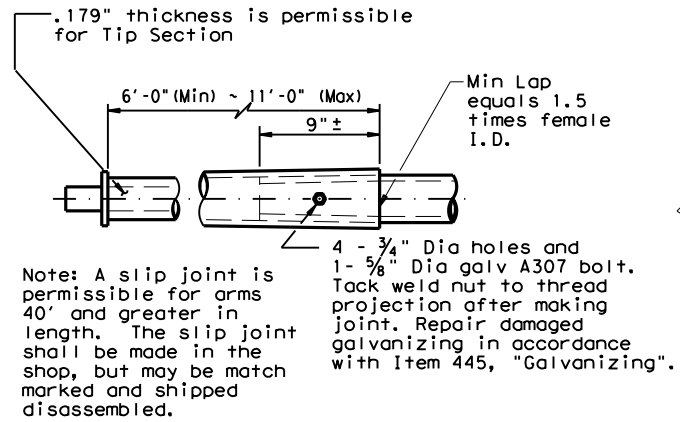
**SINGLE MAST ARM ASSEMBLY**

**(80 MPH WIND ZONE)**

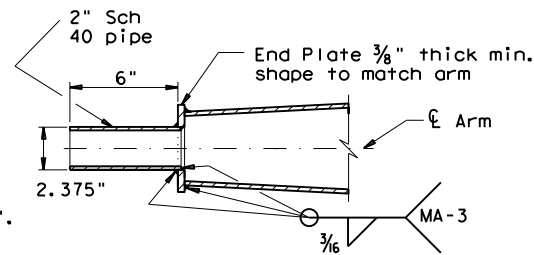
**SMA-80(1)-12**

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5-96	11-99	1-12	0046	06	082
DIST		COUNTY		SHEET NO.	
ATL		BOWIE		75	

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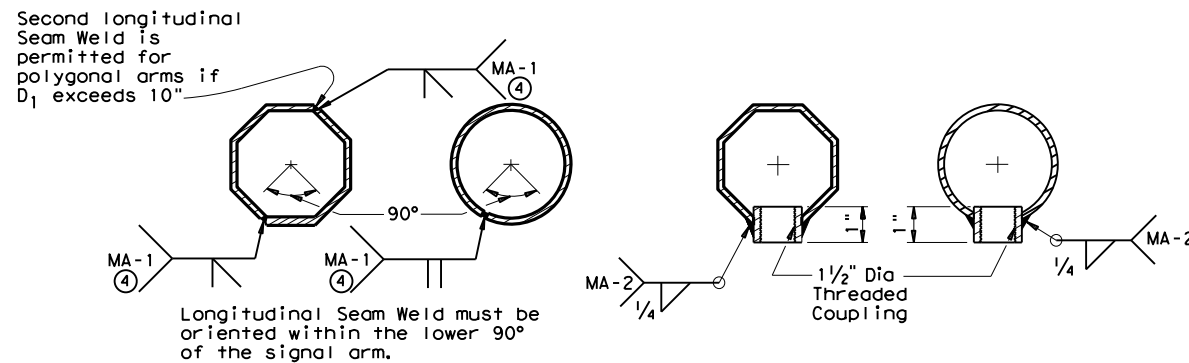
**SLIP JOINT DETAIL**



**TENON DETAIL**

Stainless steel bands (or Cables) and cast bracket as in "Astro-Brac", "Sky Bracket" or "Easy Bracket" with 1 1/2" Dia Threaded Coupling.

**BRACKET ASSEMBLY**



**ARM WELD DETAIL**

**ARM COUPLING DETAILS**

④ 60% Min. penetration  
100% penetration within 6" of circumferential base welds.

**VIBRATION WARNING**

Mast Arms of SMA and DMA structures and clamp-on Arms of LMA structures of approximately 40 ft or longer are subject to harmonic vertical vibrations in light wind conditions due to the aeroelastic characteristics of a few of the myriads of possible combinations of the following: signal numbers, weights and positions; existence/solidity of backplates; presence of additional attachments to the arm, such as signs and cameras; arm-wind orientation; and arm-pole stiffness.

Such vibrations may cause fatigue damage to the structure and may lead to galloping in moderate wind conditions which may further damage the structure and alarm the public. Tests have indicated that when wind is blowing toward the back side of signal heads having un-vented backplates attached the probability of unacceptable harmonic vibration and/or galloping is rather high.

If backplates are not required for improved visibility they should not be applied to the signal heads or, if they must be applied, they should be vented as a first and inexpensive measure to mitigate vibrations.

The traffic signal mast arms shall be visually inspected in 5 to 20 mph wind conditions after installation of signal heads and any attachments, including any required backplates. If vertical movements with a total excursion (maximum upward excursion to maximum downward excursion) of more than approximately 8" are observed at the arm tip, a damping plate shall be fitted to the arm. See "Damping Plate Mounting Details" on standard sheet, MA-DPD-10.

This visual inspection shall be repeated after each modification of the structure that could affect its aeroelastic response. Excessive vibrations shall not be allowed to continue for more than two days.

**GENERAL NOTES:**

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Specifications thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor.

Poles are designed to support one 8'-0" luminaire arm, one 9'-0" internally lighted street name sign and one traffic signal arm with a length as tabulated. The specified luminaire load applied at the end of the luminaire arm equals 60 lbs vertical dead load plus the horizontal wind load on an effective projected area of 1.6 sq ft. The specified internally lighted street name sign load applied 4.5 ft from the centerline of the pole equals 85 lbs vertical dead load plus horizontal wind load on an effective projected area of 11.5 sq ft. The specified signal load applied at the end of the traffic signal arm equals 180 lbs vertical dead load plus the horizontal wind load on an effective projected area of 32.4 sq ft (actual area times drag coefficient).

See Standard Sheet "MA-D" for pole details, "MA-C" for traffic signal arm connection details, "MA-C (ILSN)" for internally lighted street name sign arm connection details, "LUM-A" for luminaire arm and connection details, "SNS" for internally lighted street name sign details, and "TS-FD" for anchor bolt and foundation details. See "MA-C" for material specifications.

Fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. Materials, fabrication tolerances, and shipping practices shall meet the requirements of this sheet and Item 686, "Traffic Signal Pole Assemblies (Steel)".

Unless otherwise noted, all parts shall be galvanized in accordance with Item 445, "Galvanizing", after fabrication.

Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

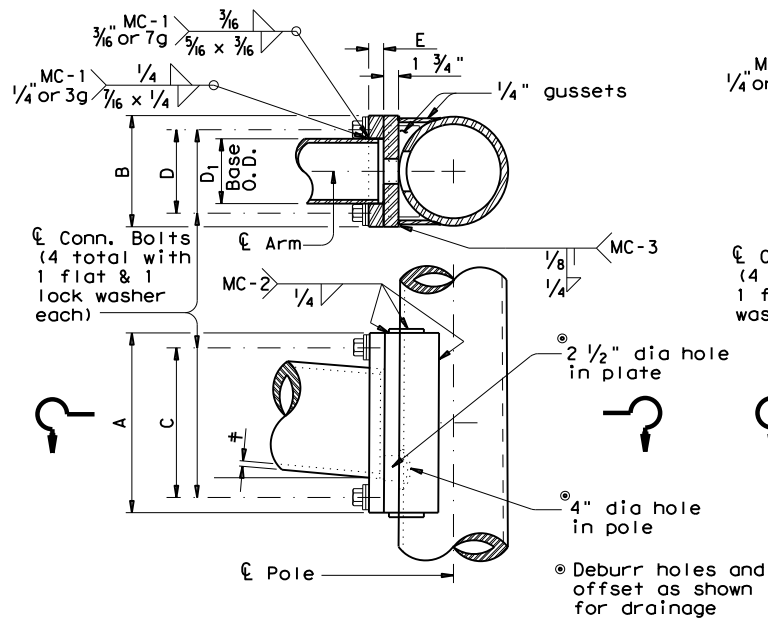
**Texas Department of Transportation**  
 Traffic Operations Division  
**TRAFFIC SIGNAL SUPPORT STRUCTURES**  
**SINGLE MAST ARM ASSEMBLY**  
**(80 MPH WIND ZONE)**  
**SMA-80 (2) - 12**

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		ATL	BOWIE	76	

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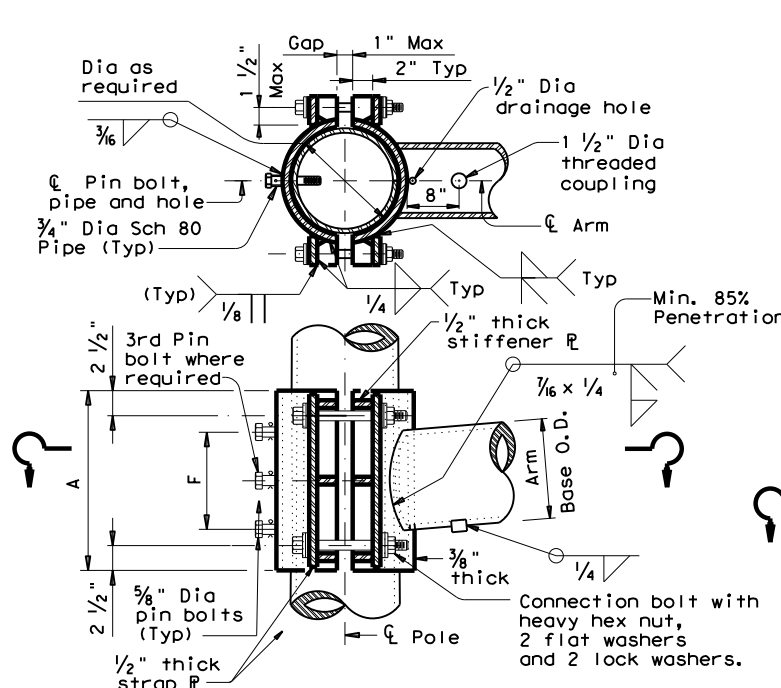
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ARM SIZE		A	B	C	D	E	CONN BOLT DIA
D <sub>1</sub>	ϕ	in.	in.	in.	in.	in.	in.
6.5	.179	12	9	9	6	1 3/4	1
7.5	.179	13	9	10	6	1 3/4	1
8.0	.179	14	10	11	7	2	1 1/4
9.0	.179	16	11	13	8	2	1 1/4
9.5	.179	17	12	14	9	2	1 1/4
9.5	.239	18	12	15	9	2	1 1/4
10.0	.239	18	12	15	9	2	1 1/4
10.5	.239	18	13	15	10	3	1 1/2
11.0	.239	18	13	15	10	3	1 1/2



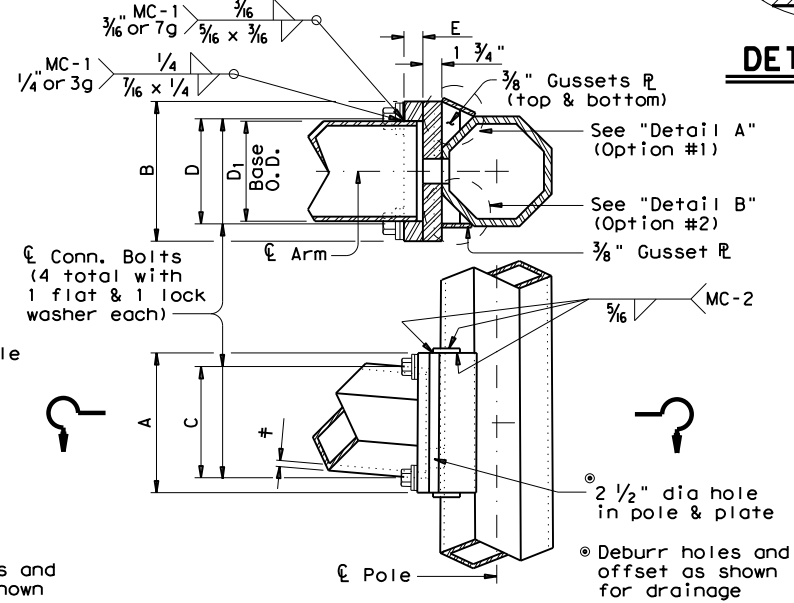
**FIXED MOUNT DETAIL 1**

ARM SIZE		A	F	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	ϕ	in.	in.	No.	Dia	No.	Dia
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	4	1 1/4	3	5/8
9.5	.239	18	12	4	1 1/4	3	5/8
10.0	.239	18	12	4	1 1/4	3	5/8



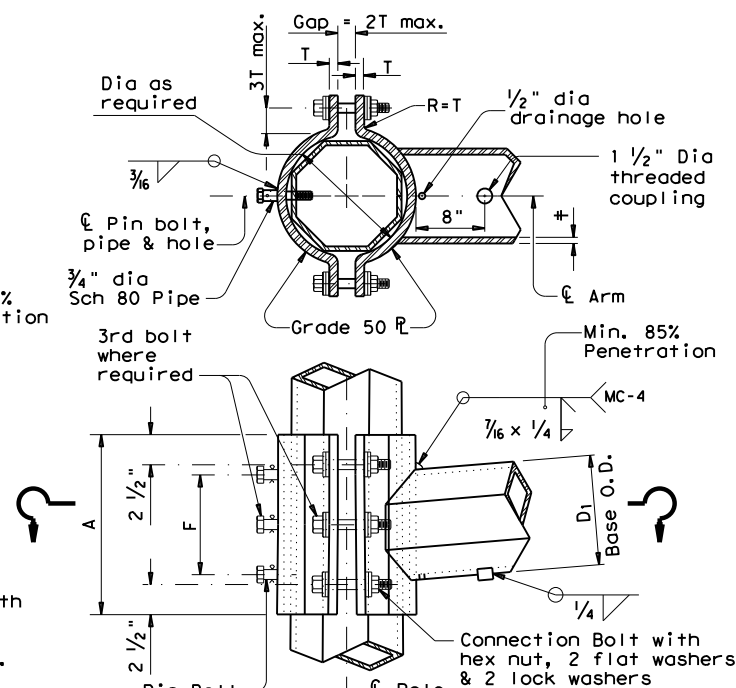
**CLAMP-ON DETAIL 1**

ARM SIZE		A	B	C	D	E	CONN BOLT DIA
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7.0	.179	11	11	8	8	1 3/4	1 1/4
7.5	.179	11	11	8	8	1 3/4	1 1/4
8.0	.179	11	11	8	8	2	1 1/4
9.0	.179	13	13	10	10	2	1 1/4
10.0	.179	13	13	10	10	2	1 1/4
9.5	.239	13	13	10	10	2	1 1/4
10.0	.239	14	14	11	11	2	1 1/2
11.0	.239	14	14	11	11	3	1 1/2
11.5	.239	14	14	11	11	3	1 1/2

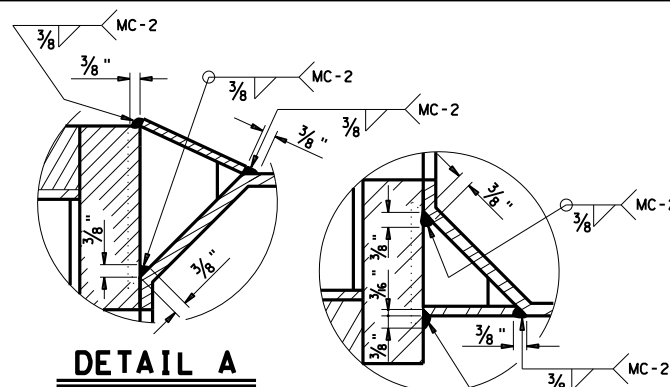


**FIXED MOUNT DETAIL 2**

ARM SIZE		A	F	T	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	ϕ	in.	in.	in.	No.	Dia	No.	Dia
7.0	.179	12	6	3/4	4	3/4	2	5/8
7.5	.179	14	8	3/4	4	3/4	2	5/8
8.0	.179	14	8	3/4	4	3/4	2	5/8
9.0	.179	16	10	7/8	4	1	2	5/8
10.0	.179	18	10	7/8	4	1	2	5/8
9.5	.239	18	10	1	6	1	3	5/8
10.0	.239	18	10	1	6	1	3	5/8

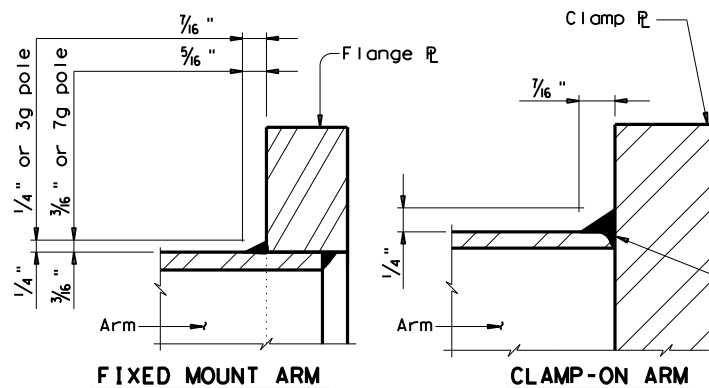


**CLAMP-ON DETAIL 2**



**DETAIL A**

**DETAIL B**

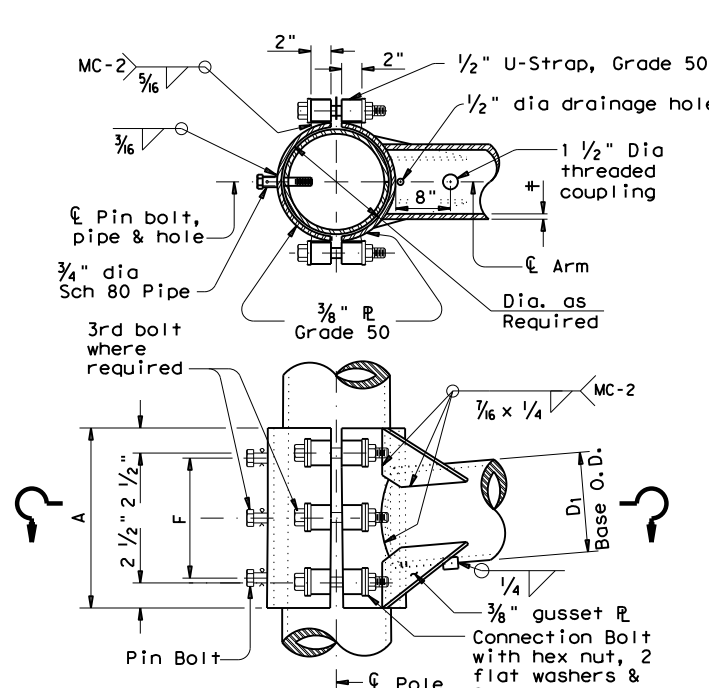


**FIXED MOUNT ARM**

**CLAMP-ON ARM**

**ARM BASE WELD DETAILS**

ARM SIZE		A	F	CONN. BOLTS		PIN BOLTS	
D <sub>1</sub>	ϕ	in.	in.	No.	Dia	No.	Dia
6.5	.179	12	6	4	1	2	5/8
7.5	.179	14	8	4	1	2	5/8
8.0	.179	14	8	4	1	2	5/8
9.0	.179	16	10	4	1	2	5/8
9.5	.179	18	12	6	1	3	5/8
9.5	.239	18	12	6	1	3	5/8
10.0	.239	18	12	6	1	3	5/8



**CLAMP-ON DETAIL 3**

MATERIALS	
Round Shafts or Polygonal Shafts ①	ASTM A595 Gr.A, A588, A1008 HSLAS Gr.50 Class 2, A1011 HSLAS Gr.50 Class 2, A572 Gr.50 or A1011 SS Gr.50 ②
Plates ①	ASTM A36, A588, or A572 Gr.50
Connection Bolts	ASTM A325 or A449, except where noted
Pin Bolts	ASTM A325
Pipe ①	ASTM A53 Gr.B, A501, A1008 HSLAS-F Gr.50, A1011 HSLAS-F Gr.50
Misc. Hardware	Galvanized steel or stainless steel or as noted

- ① ASTM A572, A1008 HSLAS, A1011 HSLAS, A1008 HSLAS-F, A1011 HSLAS-F or A1011 SS may have higher yield strengths but shall not have less elongation than the grade indicated.
- ② ASTM A1011 SS Gr.50 material shall also have a minimum elongation of 18 percent in 8 inches or 23 percent in 2 inches. Material thickness in excess of those stipulated under A1011 SS will be acceptable providing the material meets all other A1011 SS requirements and the requirements of this item.

**GENERAL NOTES:**

Clamp-on details are used for the second arm on dual mast arm assemblies. A Maximum 1 1/2" wide vertical slotted hole shall be cut in the front clamp plate to facilitate drainage during galvanizing. The slot shall be centered behind the arm and shall be no longer than the arm diameter minus 1"

Fixed mount details are used for single mast arm assemblies and for the first arm on dual mast arm assemblies.

Where duplicate parts occur on a detail, welds shown for one part shall apply to all similar parts on the detail.

Pin bolts are required to prevent rotation of clamp-on arms under design wind forces.

**NOTE:**

Pin bolts shall be A325 with threads excluded from the shear plane. Pin bolt and 3/4" dia pipe shall have 3/16" dia holes for a 1/8" dia galvanized cotter pin. Back clamp plate shall be furnished with a 3/4" dia hole for each pin bolt. An 1/16" dia hole for each pin bolt shall be field drilled through the pole after arm orientations have been approved by the Engineer.

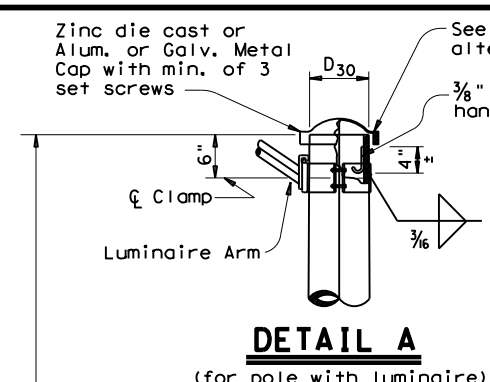
Texas Department of Transportation  
 Traffic Operations Division

**STANDARD ASSEMBLY  
 FOR TRAFFIC SIGNAL  
 SUPPORT STRUCTURES  
 MAST ARM CONNECTIONS**

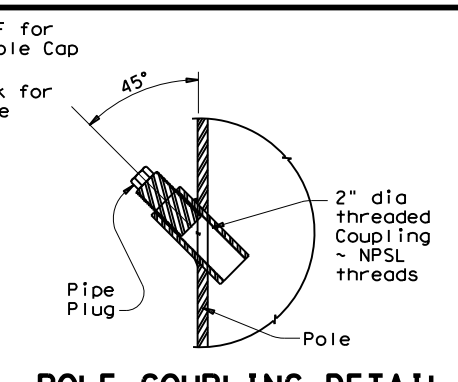
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1-12		ATL	BOWIE		77

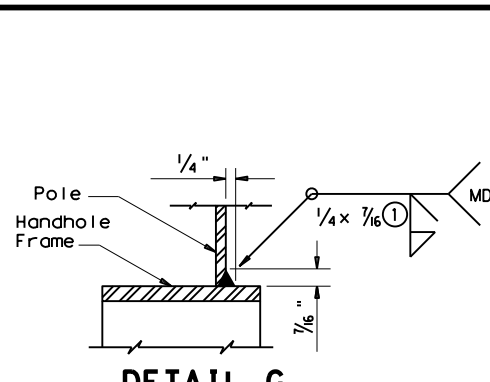
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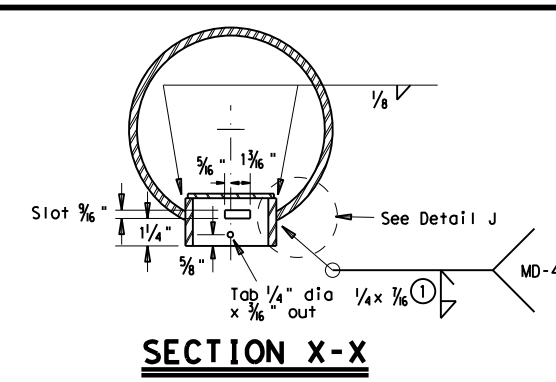
**DETAIL A**  
(for pole with luminaire)



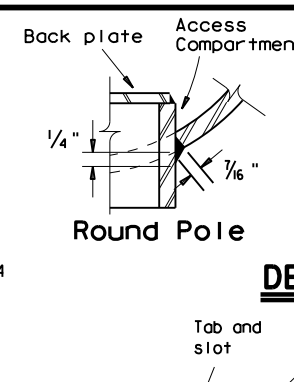
**POLE COUPLING DETAIL**



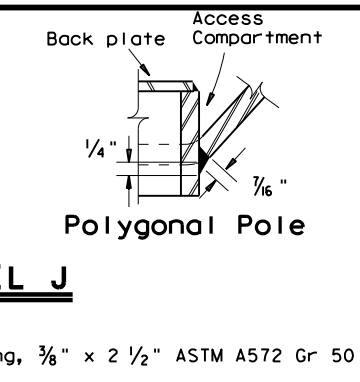
**DETAIL G**



**SECTION X-X**

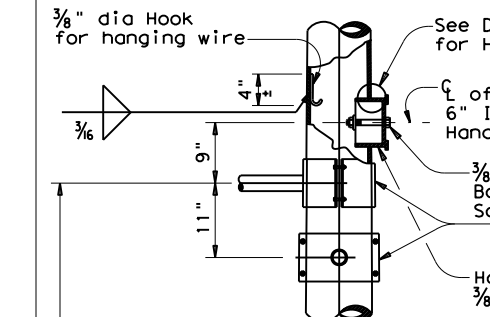


**Round Pole**

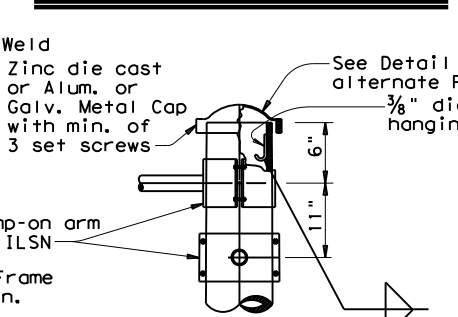


**Polygonal Pole**

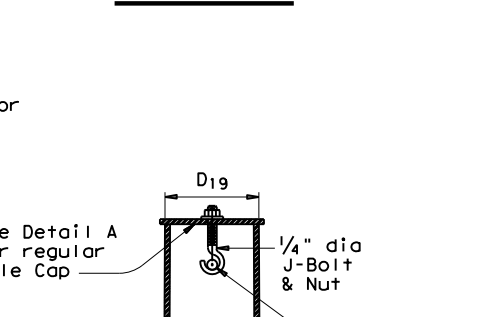
**DETAIL J**



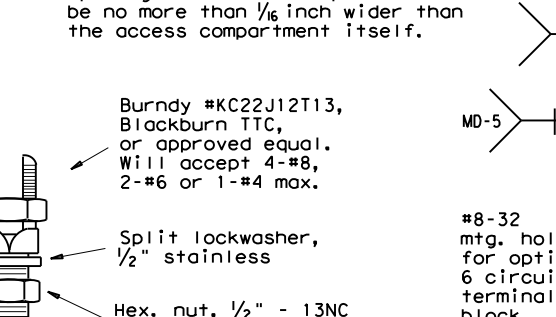
**DETAIL B**  
(If ILSN applied)



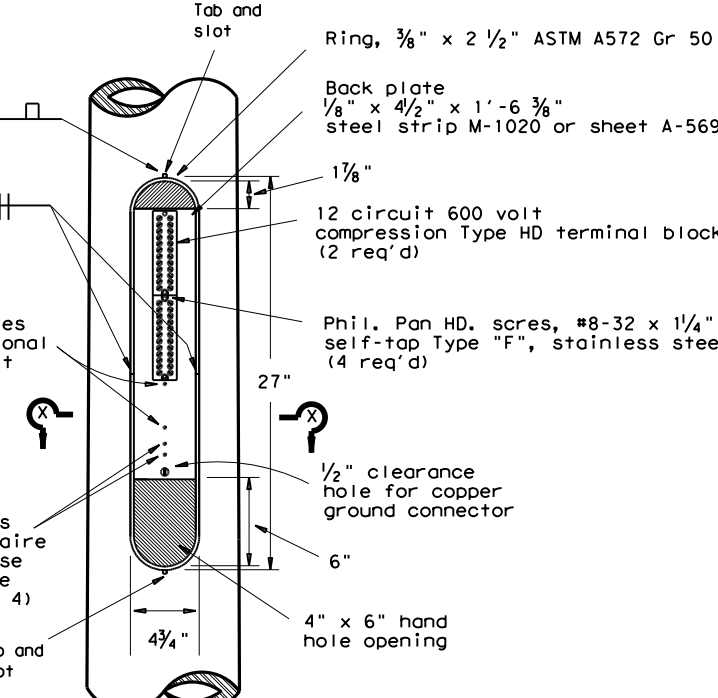
**DETAIL C**



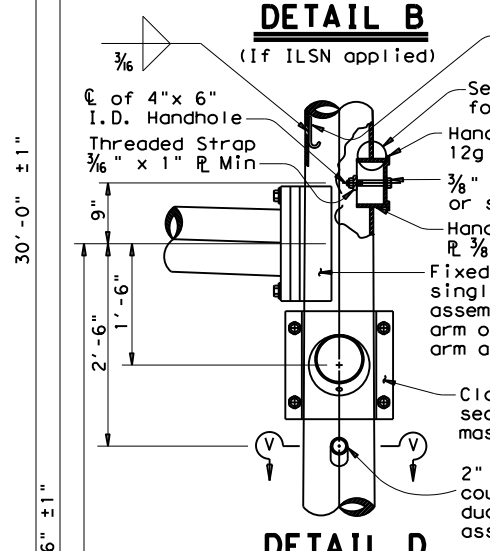
**SECTION Y-Y**



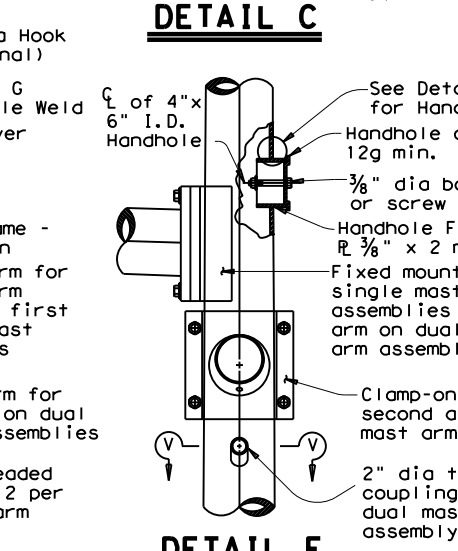
**COPPER GROUND CONNECTOR**



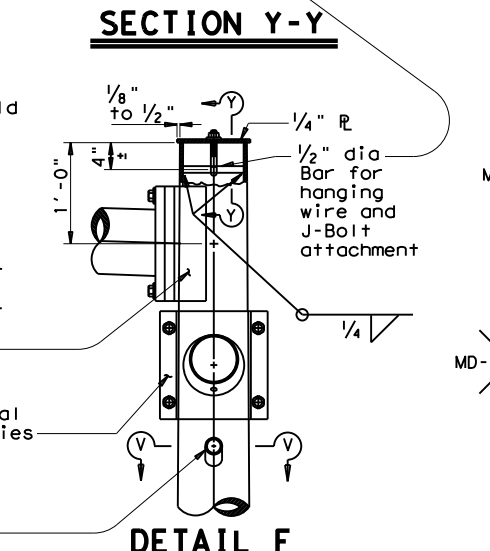
**ACCESS COMPARTMENT**



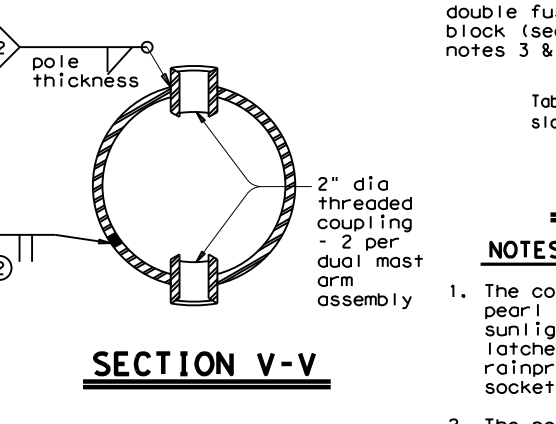
**DETAIL D**  
(for 30" pole with luminaire and ILSN sign)



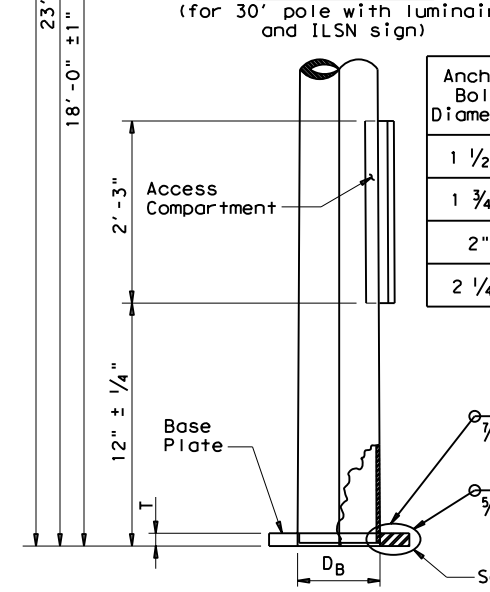
**DETAIL E**  
(for 24" pole with ILSN sign and no luminaire)



**DETAIL F**  
(for 19" pole with no ILSN sign and no luminaire)

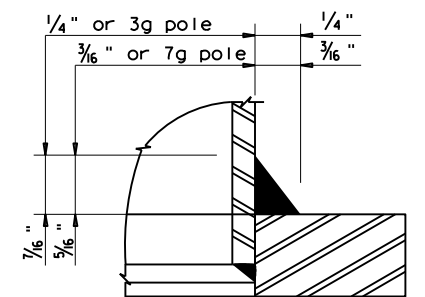


**SECTION V-V**

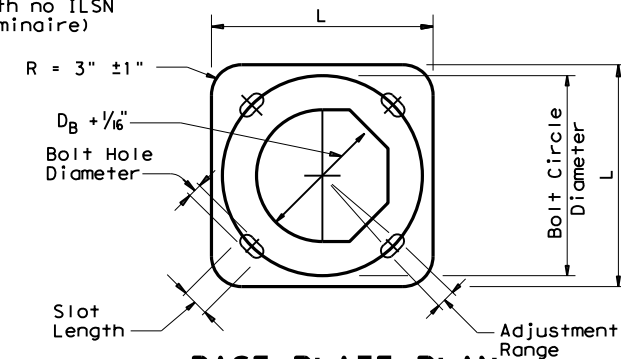


**POLE ELEVATION**

Anchor Bolt Diameter	Bolt Hole Diameter	Slot Length	Bolt Circle Diameter	Base R Dim. L x T	Adjust. Range
1 1/2"	1 3/4"	3 1/2"	17"	18" x 1 1/2"	13.4°
1 3/4"	2"	4"	19"	20" x 1 3/4"	13.5°
2"	2 1/4"	4 1/2"	21"	22" x 2"	13.6°
2 1/4"	2 1/2"	5"	23"	24" x 2 1/4"	13.7°



**DETAIL H**



**BASE PLATE PLAN**

- ① 85% Min. penetration
- ② 60% Min. penetration  
100% penetration within 6" of circumferential base welds.

**NOTES:**

1. The cover shall be one piece formed from ABS plastic, shall be a pearl gray color, and shall be suitable for exposure to harsh sunlight and extreme weather. Cover shall latch with two screw latches and shall fit tightly to the enclosure ring to create a rainproof seal. Latch screws shall be 1/4-20 stainless flat socket head screws with tamper proof feature.
2. The pole manufacturer shall provide with each pole a separate kit consisting of: one cover with two latching assemblies, two terminal strips (Marathon #985GP12CU or approved equal), four #8-32 x 1 1/4" self tapping type "F" stainless steel pan head screws, and one ground connector (Blackburn TTC, Burndy KC22J12T13, or IlSCO SSS-5). The traffic signal contractor shall install the kit items in the field.
3. The screw hole spacing on the enclosure back plate shall be for two Marathon #985GP12 terminal strips, one Marathon #985GP06CU terminal strip, and one Bussmann #BM6032B fuse block.
4. Install one Bussmann #BM6032B, Littelfuse #L60030M-2C, or Ferraz-Shawmut #30352 fuse block for poles where luminaires are to be installed.

Texas Department of Transportation  
 Traffic Operations Division

TRAFFIC SIGNAL  
 SUPPORT STRUCTURES  
 MAST ARM POLE DETAILS

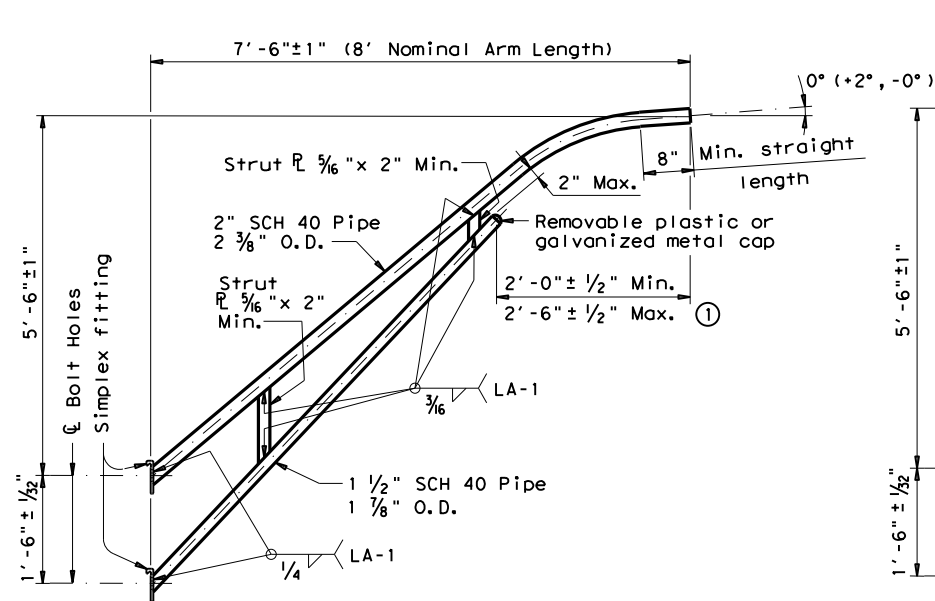
MA-D-12

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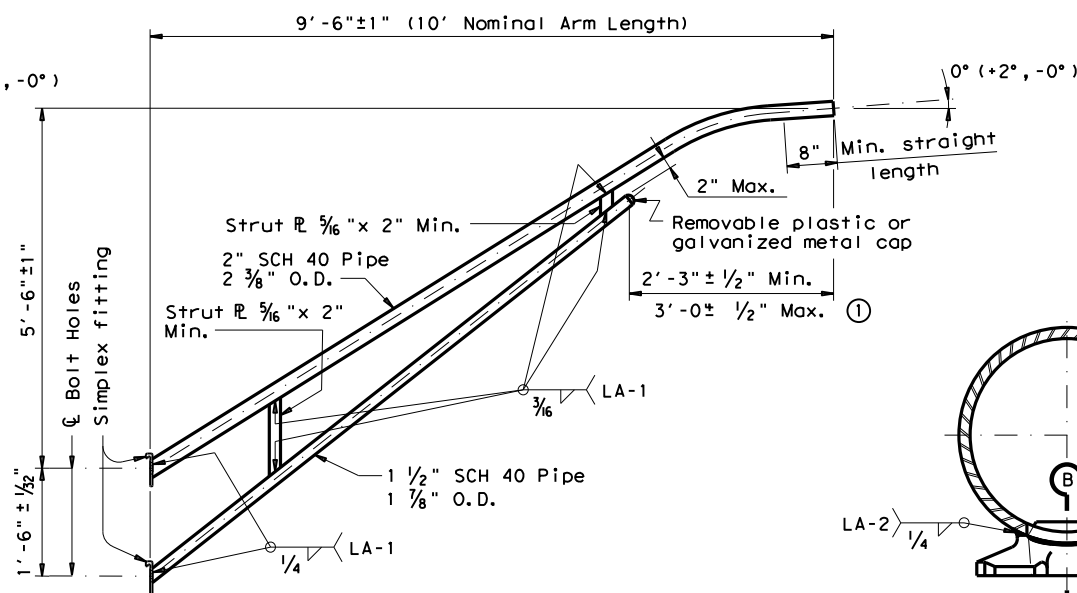


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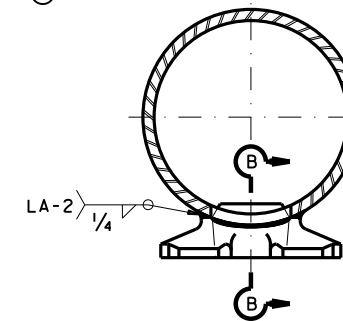
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8-FOOT LUMINAIRE ARM



10-FOOT LUMINAIRE ARM



DIRECT ATTACHMENT DETAIL

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr. 65-35 or A148 Gr. 80-50, A576 Gr. 1021 ③, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr. B, A501, A1008 HSLAS-F Gr. 50 ④, or A1011 HSLAS-F Gr. 50 ④
Arm Strut Plates ②	ASTM A36, A572 Gr. 50 ④, or A588
Misc.	ASTM designations as noted

- ① Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.
- ② Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.
- ③ A576 must be suitable for forging and also meet minimum tensile strength of 65 ksi, minimum yield of 35 ksi, and elongation in 2 inches of 22 percent.
- ④ ASTM A572, A1008 HSLAS-F, and A1011 HSLAS-F may have higher yield strengths but shall not have less elongation than the grade indicated.

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals and Interim Revisions thereto. Design Wind Speed equals 90 mph plus a 1.3 gust factor. Arms are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft.

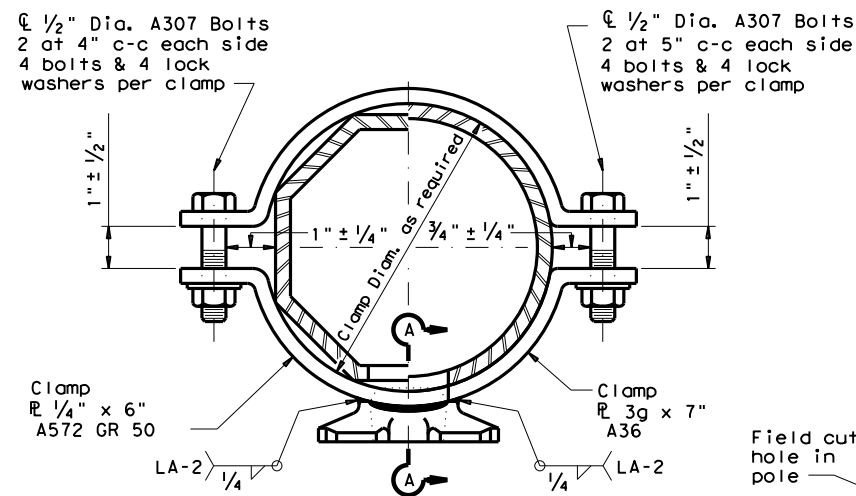
Materials and fabrication shall be in accordance with Item 686, "Traffic Signal Pole Assemblies (Steel)" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified Fabricator tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

Unless otherwise noted, all parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing".

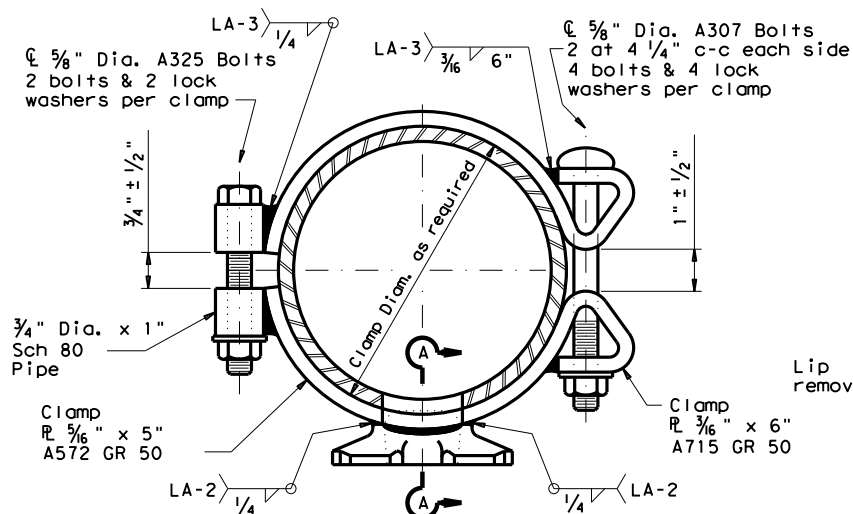
Deviation from the details and dimensions shown herein require submission of shop drawings in accordance with Item 441, "Steel Structures". Alternate designs are not acceptable.

Each pole simplex fitting shall be supplied with 2 ASTM A325 bolts and 2 lock washers of the size specified. The bolts and lock washers shall be secured to the pole with the other hardware items called for in the plans. When clamp attachment is specified, the Fabricator shall ship the clamp assembly securely attached to the pole at the location shown on the plans.

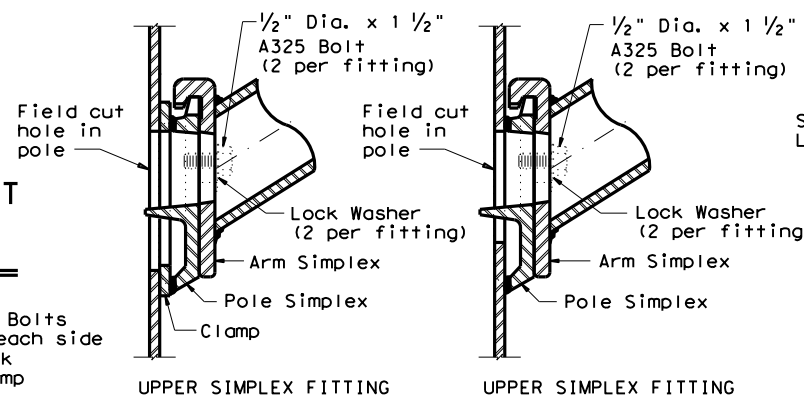
If clamp assemblies are ordered without poles, the Fabricator shall ship one upper and one lower clamp assembly together in a single package, including all nuts and washers required for the clamps and simplex fittings.



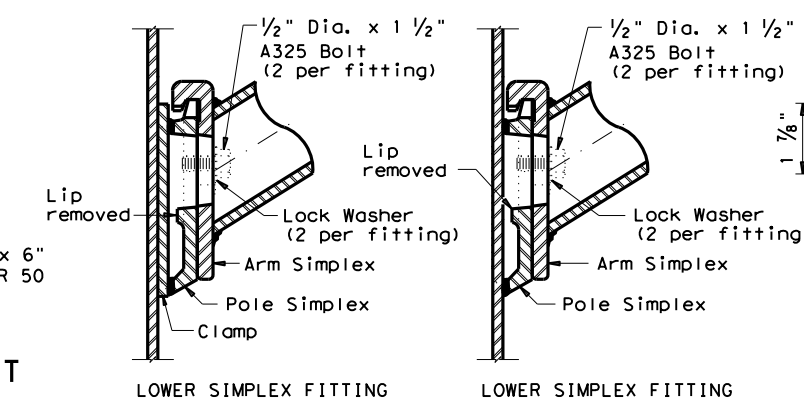
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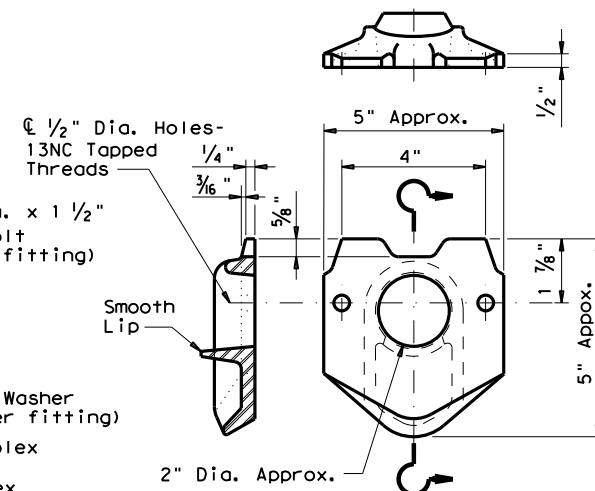
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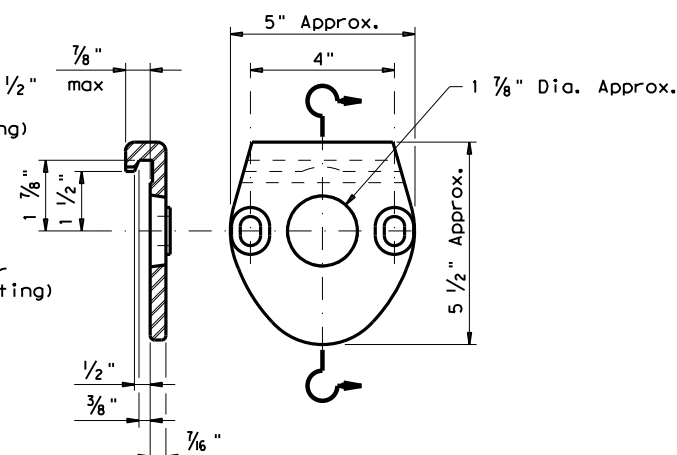
UPPER SIMPLEX FITTING LOWER SIMPLEX FITTING



SECTION A-A SECTION B-B



POLE SIMPLEX DETAIL



ARM SIMPLEX DETAIL

Texas Department of Transportation  
 Traffic Operations Division  
**STANDARD ASSEMBLY DRAWINGS FOR LUMINAIRE SUPPORT STRUCTURES**  
 ARM DETAILS  
**LUM-A-12**

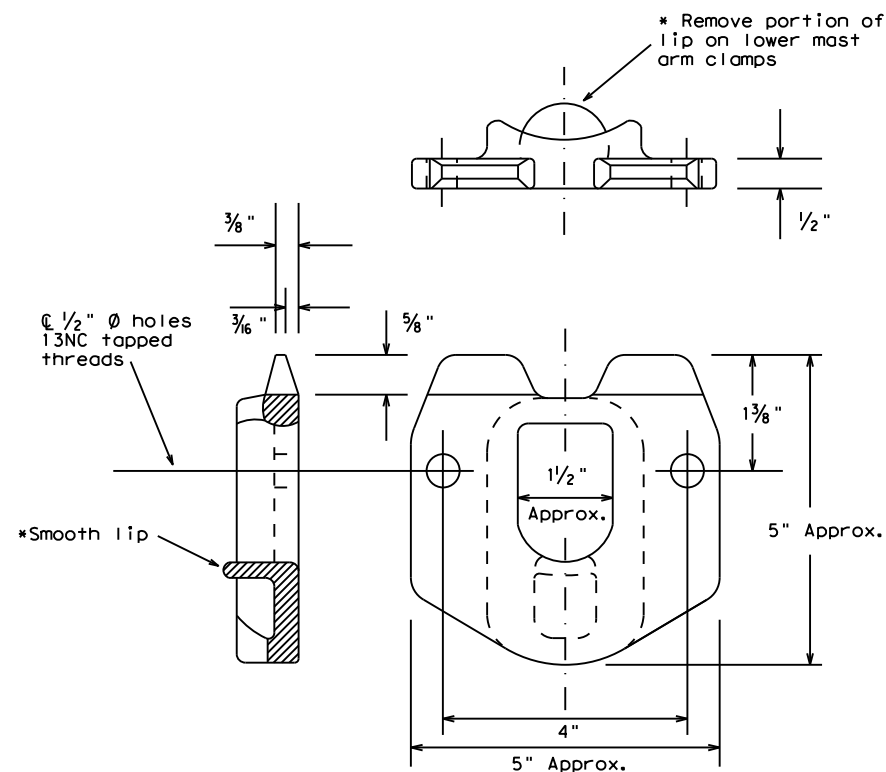
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DIST	COUNTY	SHEET NO.			
ATL	BOWIE	80			

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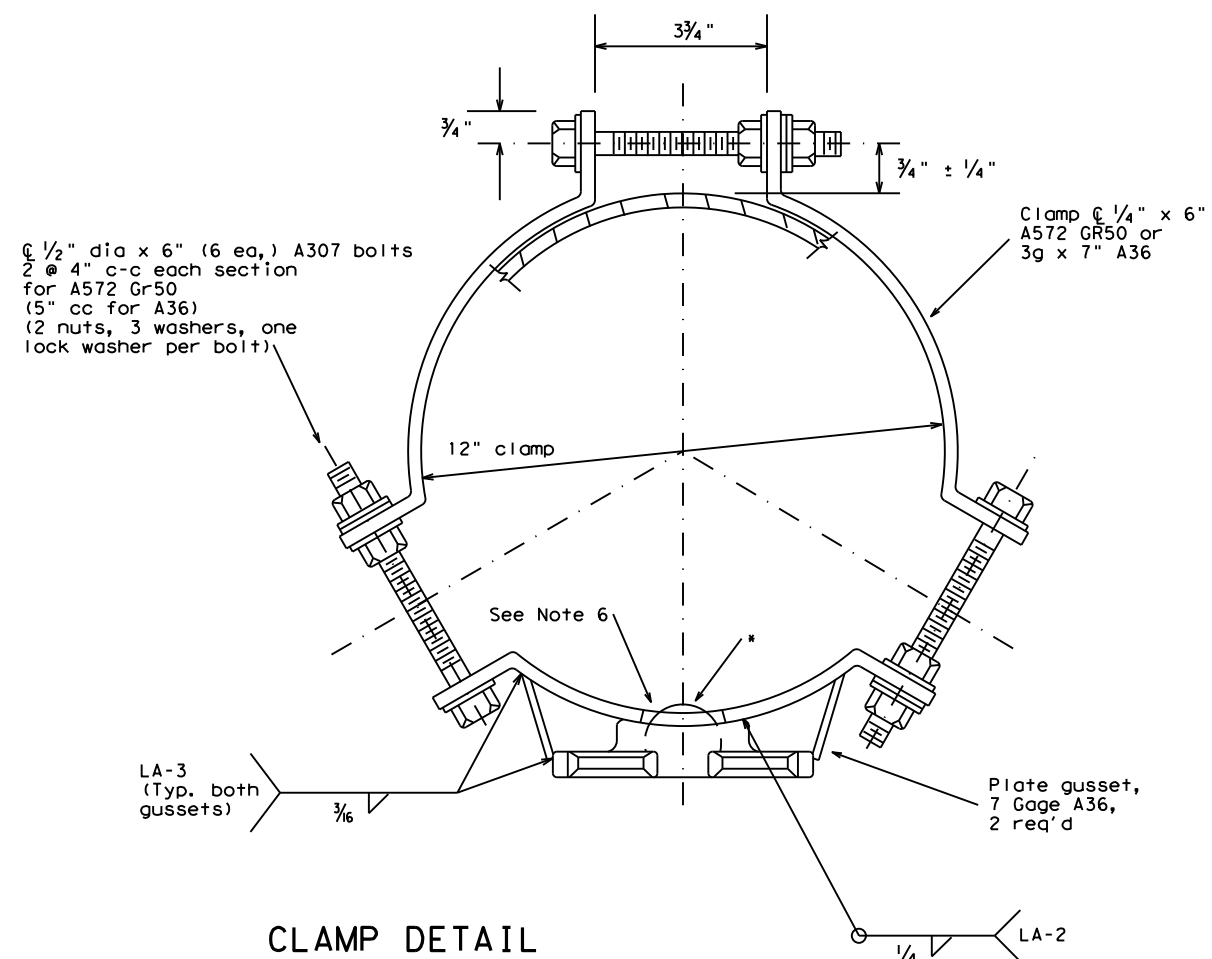
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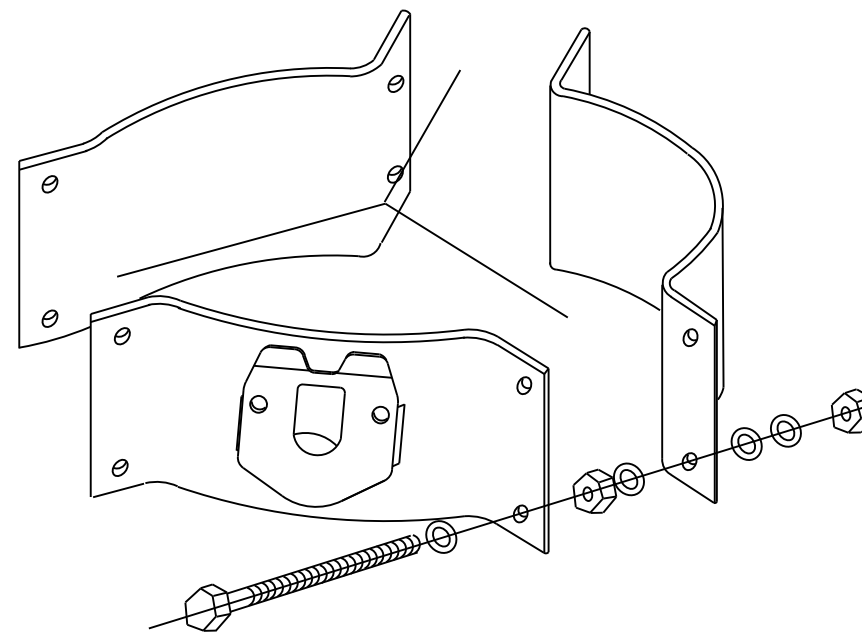
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POLE SIMPLEX DETAILS



CLAMP DETAIL



PROJECTION

For 8.9 - 12 inch diameter Signal Poles  
(Two req'd for each mast arm)

OTHER MATERIALS:

1. Pole simplex shall be ASTM A27 GR65-35 or A148 GR80-50 or A576 GR1021. ASTM A576 must be suitable for forging and also meet minimum tensile of 65ksi, minimum yield of 35ksi, and a minimum elongation of 22 percent in 2 inches.
2. Welded tabs and backplates shall be ASTM A-36 steel or better.
3. Nylon insert locknuts shall conform to ASTM A563.

GENERAL NOTES:

1. Materials and fabrication shall be in accordance with Standard Sheet "MA-C" and with the details, dimensions, and weld procedures shown herein. Weld references call for preapproved weld procedures which the Fabricator must obtain prior to fabrication. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.
2. All parts shall be galvanized after fabrication in accordance with Item 445, "Galvanizing". The throat of the Simplex shall be made free of all rough or sharp edges resulting from the galvanizing process.
3. Each simplex fitting shall be supplied with 2 ASTM A325 bolts, 1/2 in. x 1 1/2 in. and 2 lock washers. The bolts and lock washers shall be secured to the clamp with the other hardware items. The Fabricator shall ship clamp assembly together in a single package, including all bolts, nuts, and washers required for the clamp and simplex fitting.
4. Design conforms to 1994 AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals" and interim revisions thereto. Design Wind Speed equals 80 mph plus a 1.3 gust factor. Clamps are designed to support a 60 lb. luminaire having an effective projected area (actual area times drag coefficient) of 1.6 sq. ft., 12 ft. maximum arm length.
5. Each assembly shall consist of one upper piece simplex fitting having a smooth lip and one lower piece simplex fitting with the lip removed.
6. Approximately 2 in. diameter hole in upper mast arm clamp.

Texas Department of Transportation  
Traffic Operations Division

CLAMP ON  
FITTING ASSEMBLY FOR  
LUMINAIRE MAST ARM

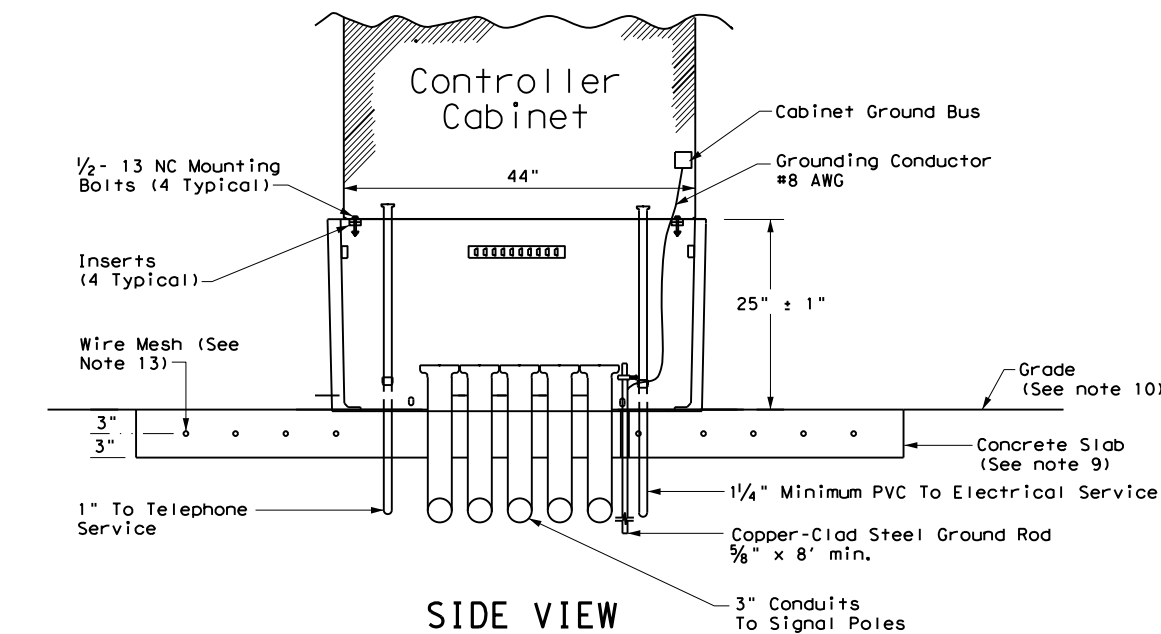
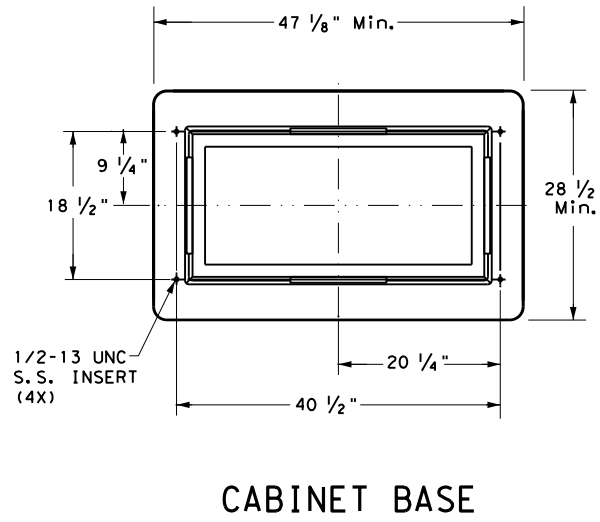
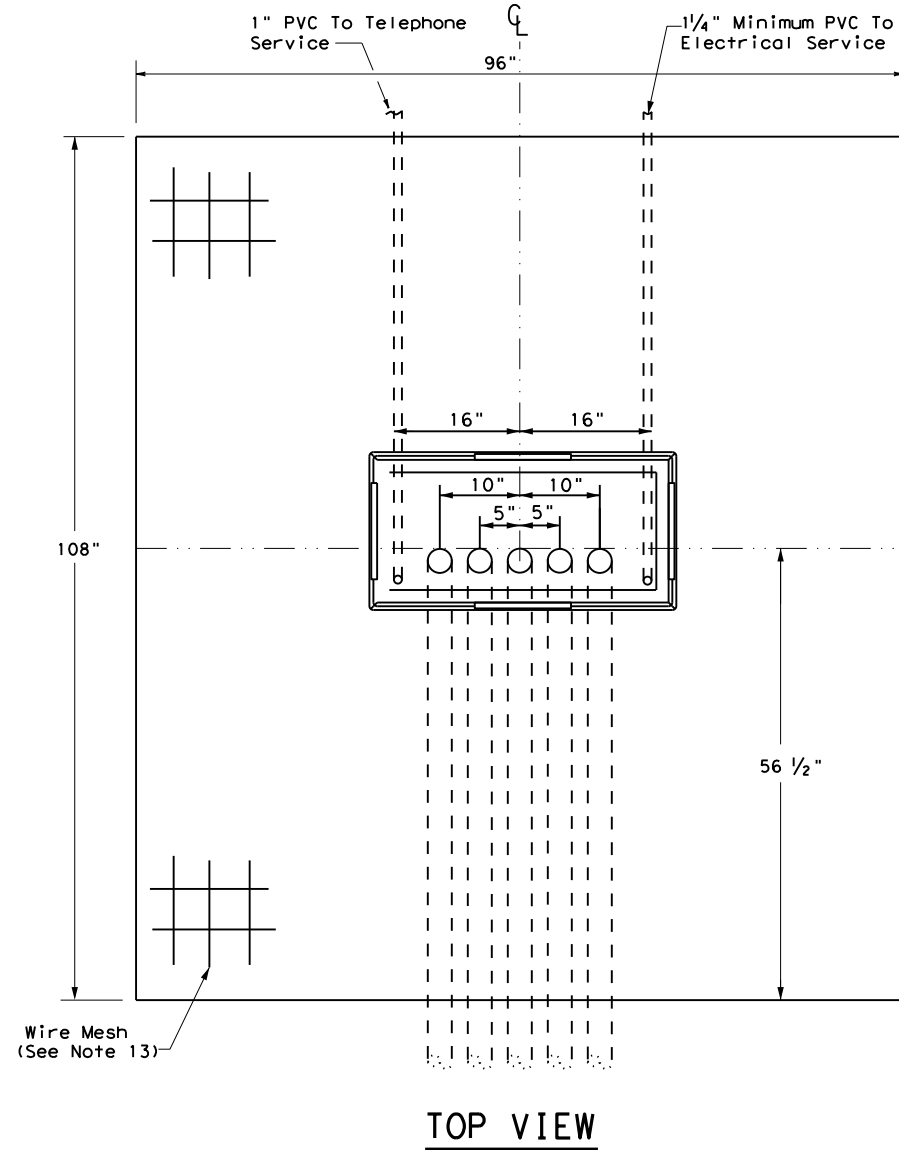
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11-99 1-12	REVISIONS	CONT	SECT	JOB
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		ATL	BOWIE	81



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**TRAFFIC SIGNAL CONTROLLER BASE:**

1. Provide a traffic signal controller base (cabinet base) manufactured of polymer concrete material consisting of calcareous and siliceous stone; glass fibers and thermoset polyester resin. The polymer concrete cabinet base must be reinforced on the inside of the cabinet base with fiberglass matting. Provide one of the following bases: Armorcast Part # A6001848X24, Quazite Model # PG3048Z709, or other as approved by TxDOT Traffic Safety Division.
2. The polymer concrete material must have a minimum compressive strength of 10,300 pounds per square inch (psi), minimum flexural strength of 3600 psi, and minimum shear strength of 3600 psi.
3. The polymer concrete cabinet base must conform to the dimensions shown and must accommodate a standard TxDOT basemount cabinet.
4. Supply the cabinet base with four 1#2"-13 UNC stainless steel inserts for attachment of the cabinet to the base. Inserts must withstand a minimum torque of 50 ft-lb and a minimum straight pull out strength of 750 lbs.
5. Provide the cabinet base with 4 cable racks mounted one on each side of the base 2" to 7" from the top edge of the base. Unless approved otherwise, cable racks must be 1-1/2 x 9#16x 3#16inch steel channel with eight T-slots spaced at 1-1/2 inches. The cable racks must easily accommodate the insertion of tie wraps to attach field wiring to the racks to serve as strain relief. Secure cable racks to the base using 1#2"-13 UNC stainless steel screws and inserts.
6. The cabinet base, when secured to the concrete slab with controller cabinet attached, must withstand a minimum wind load of 125 mph or a 850 lb force applied at 49" above the bottom of the base without causing the base or cabinet to come out of their anchored position or cause any permanent deformation. The manufacturer must supply certification by an independent testing laboratory or sealed by a Texas Licensed Professional Engineer. Provide the cabinet base with hardware for attachment to a concrete slab.
7. The traffic signal base must be permanently marked either by impress or by permanent ink with the manufacturer's model number and name or logo.
8. Seal the base to the concrete with a silicone caulk bead and fastened to the slab per manufacturer's instructions.

**CONCRETE SLAB:**

9. Traffic signal controller pad must be a portland cement concrete slab poured in place, must conform to the dimensions shown, and must be level.
10. Grade earthwork such that it is flush with the concrete pad on all four sides, unless otherwise shown on the plans. Subsidiary to ITEM 680, four inch rip rap may be used in lieu of earthwork. Slopes shall gradually contour to match plans.
11. Bond a #8 AWG copper ground wire and an 8 ft ground rod bonded to the reinforcing mesh by a suitable UL Listed clamp and terminated to the cabinet grounding bus for the purpose of providing a local ground for the electrical grounding conductor. The electrical grounding conductor specified in Item 680-3.A.4 is required and must be terminated to the cabinet ground bus.
12. Install a PVC sleeve to prevent the ground rod from direct embedment in the slab.
13. Provide welded wire mesh 6X6-W2.9 X W2.9 for reinforcement. Provide joints and splices in the mesh with a minimum 6-inch overlap. Center the mesh between top and bottom and provide a minimum 3 inch cover on the edges.
14. Provide Class B concrete minimum for the slab in accordance with Item 421. Construct the slab in accordance with Item 531.

**CONDUITS:**

15. Stub up and run 3-inch conduits through the slab to the various traffic signal poles and ground boxes as shown on the layouts. Install the number of conduits as shown on layouts plus two additional 3 inch conduits for future use. Terminate the conduits with a bushing between 2 and 4-inches above the slab.
16. Extend conduits for future use at least 18-inches from the edge of the slab, terminate underground with a coupling, and cap and seal so that the seal can be removed without damaging the coupling. This must also apply to unused telephone conduit.
17. Stub up two separate conduits through the slab from the electrical and telephone services. Run the conduit for the electrical feed directly to the electrical service enclosure. Run the conduit for the telephone line directly to the telephone service, usually located on the same pole as the electrical service. Telephone must not under any circumstance share a conduit with any other function.
18. Terminate electric and telephone conduits above the slab with a coupling. After the base is installed, extend the conduits above the top of the base and secure to the base using a steel one-hole strap or similar suitable substitute.

**CONTROLLER CABINET:**

19. Anchor the controller cabinet to the base using four stainless steel 1/2-13 NC bolts.
20. The silicone caulk bead specified in Item 680.3.B must be RTV 133.

**PAYMENT:**

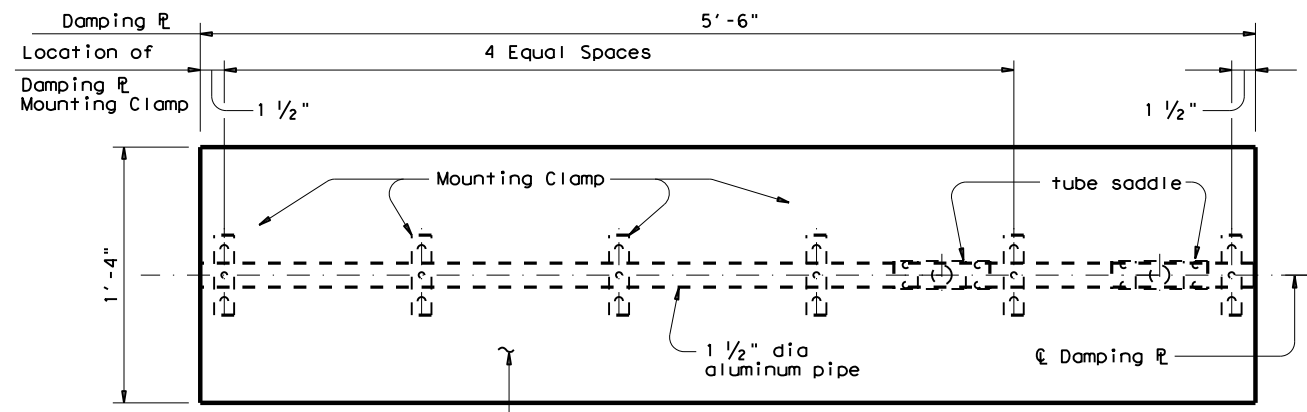
21. Bid TS-CF as subsidiary to Item 680.

<p><b>TRAFFIC SIGNAL CONTROLLER CABINET BASE AND PAD</b></p> <p><b>TS-CF-21</b></p>			
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	ATL	BOWIE	82

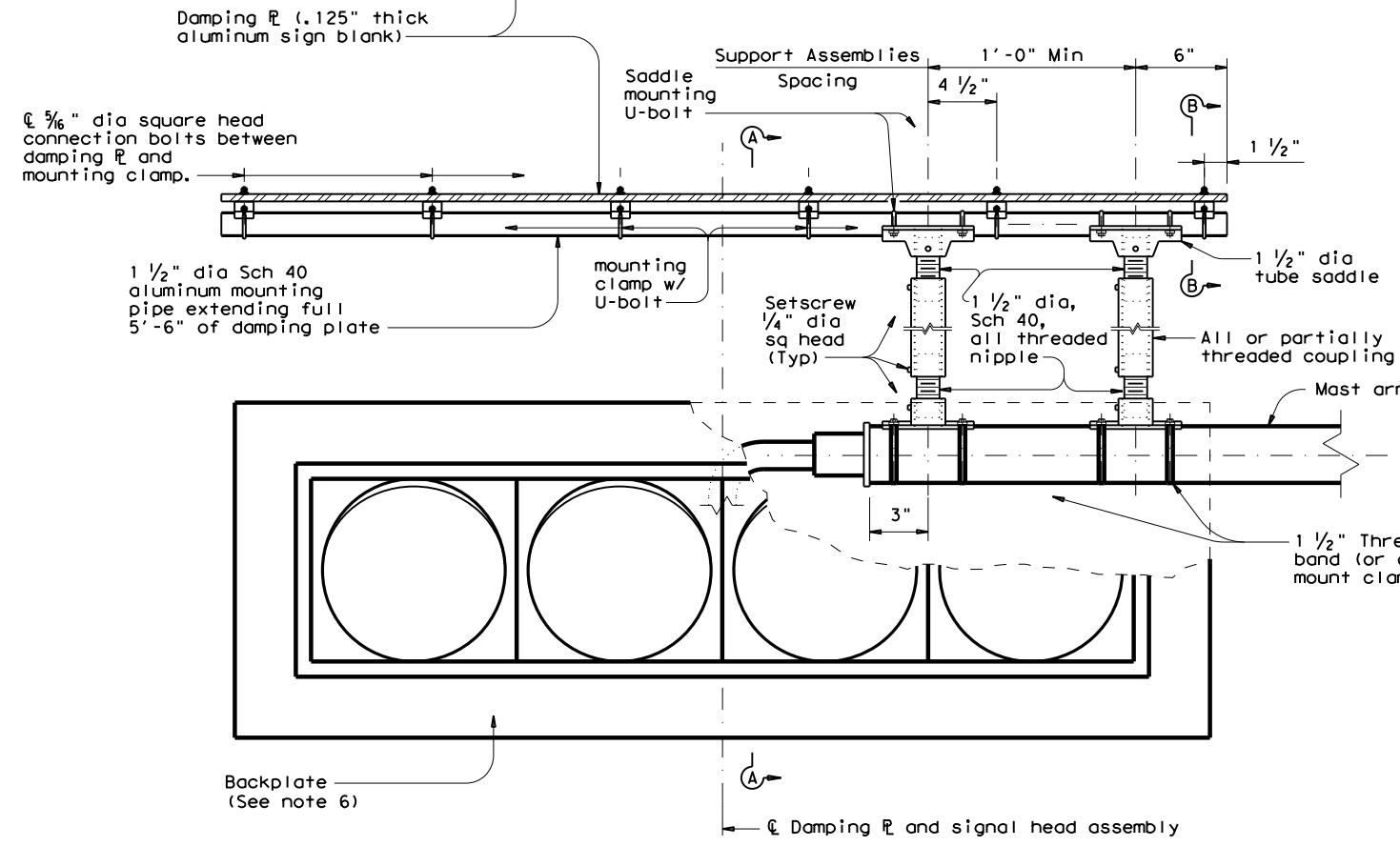


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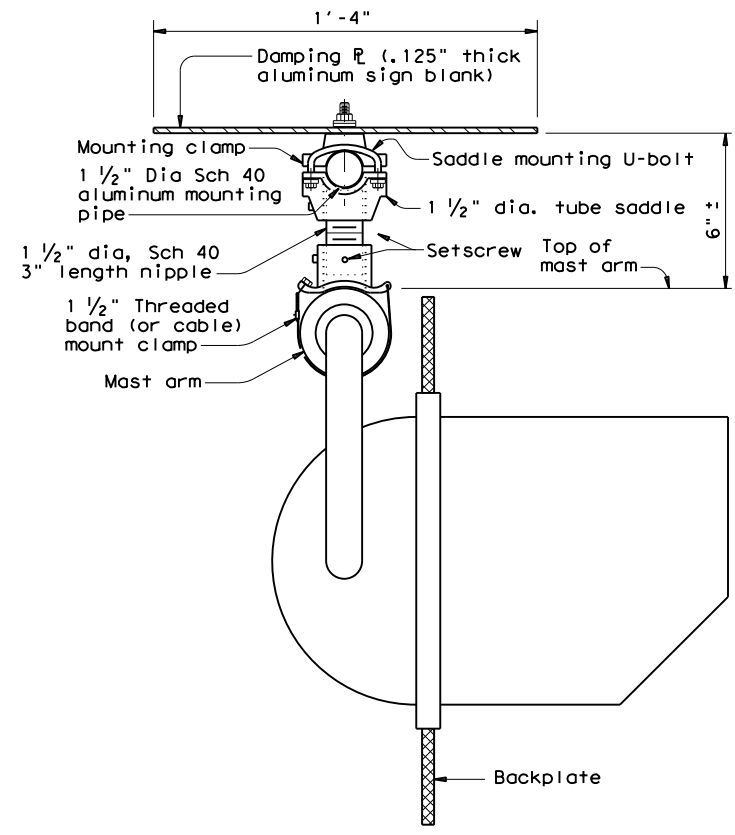


PLAN



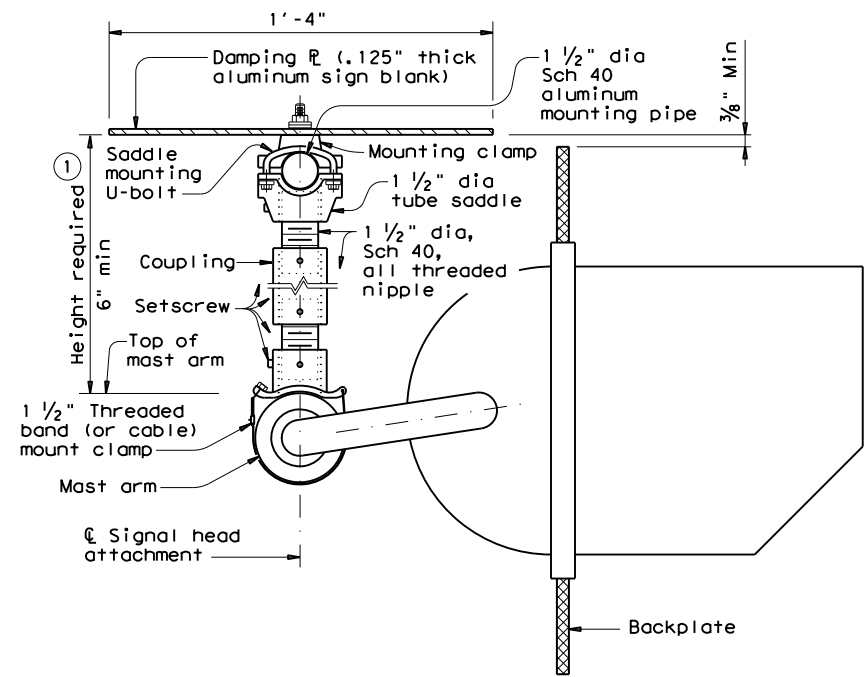
ELEVATION

**DAMPING PLATE MOUNTING DETAILS**  
 (Showing alternate placement of signal head)



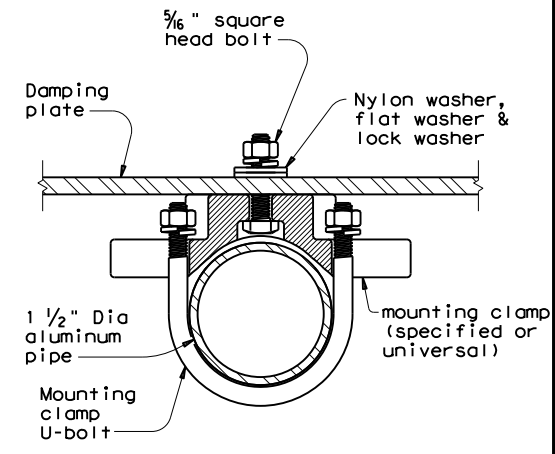
SECTION A-A

(Showing standard placement of signal head)  
 (Mounting clamp U-bolt is not shown for clarity)



SECTION A-A

(Showing alternate placement of signal head)  
 (Mounting clamp U-bolt is not shown for clarity)



SECTION B-B

(Showing damping plate attachment)

**GENERAL NOTES:**

- In accordance with the findings of TxDOT sponsored research, the installation of a damping plate in accordance with the details shown here at the end of signal mast arms of SMA and DMA standard structures reduces excessive harmonic vertical vibration, and thus fatigue damage. Any deviation from these details may reduce the effectiveness of this damping device.
- Aluminum sign blank for damping plate will conform to Departmental Material Specifications DMS-7110. Materials for mast arm mounting clamp and tube saddle will be aluminum castings or aluminum alloys as in accordance with manufacturers' stipulations. Mounting pipe, pipe nipple and coupling will be aluminum alloy 6061-T6 or 6063-T6. Damping plate mounting clamp and u-bolt assemblies will conform to Standard sheet SMD(GEN). U-bolts for saddle mounting will have a minimum yield strength of 36 ksi.
- Damping plate will be mounted horizontally. Position centerline of damping plate to align with centerline of mast arm or horizontal signal head assembly. Vertical clearance between signal head (with or without backing plate) and bottom of damping plate will be maintained as shown. The attachments shown here are examples only, other supporting details which meet both alignment and vertical clearance requirements are also acceptable.
- Unless stipulated by the manufacturers, all steel parts will be galvanized finish in accordance with Standard Specification Item 445, "Galvanizing".
- Contractor will verify applicable field dimensions before the installation.
- Backplates are optional for traffic signals. When backplates are used, Backplates will have a 2-inch fluorescent yellow AASHTO Type B<sub>FL</sub> or C<sub>FL</sub> retroreflective border conforming to TxDOT DMS-8300 "Sign Face Materials." See Sheet TS-BP-20 for backplate details.

① Recommended supporting assemblies to achieve required height for horizontal section heads

Height required	One nipple each length	Two nipples each length plus One coupling each length	
6"-6 3/4"	3"	-	-
7"-8 1/2"	4"	-	-
9"-10 1/2"	6"	-	-
11"-15 1/2"	-	4"	5"
16"-24"	-	6"	10"

Texas Department of Transportation  
 Traffic Safety Division Standard

**MAST ARM DAMPING PLATE DETAILS**

**MA-DPD-20**

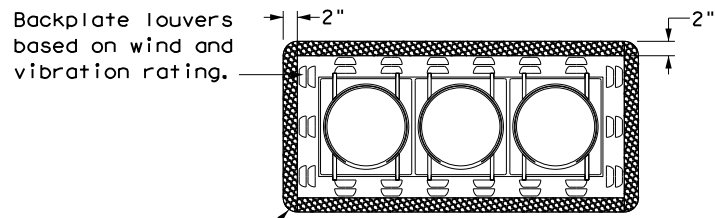
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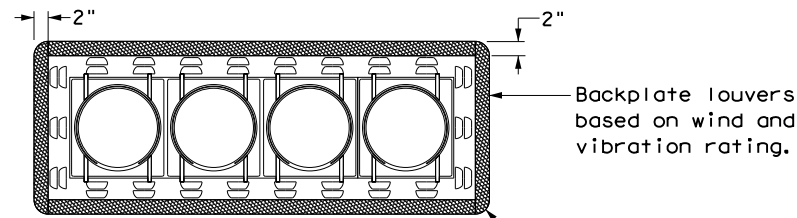
6-20    REVISIONS    DIST: ATL    COUNTY: BOWIE    SHEET NO.: 83

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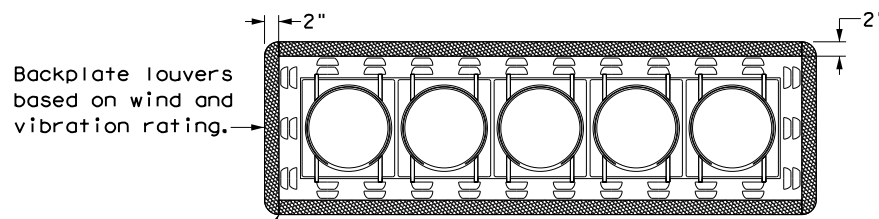
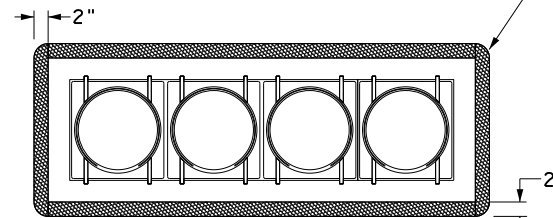
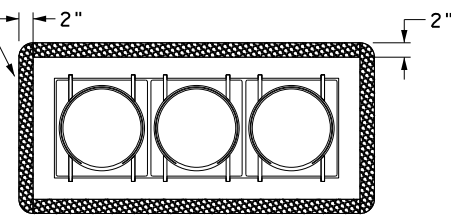
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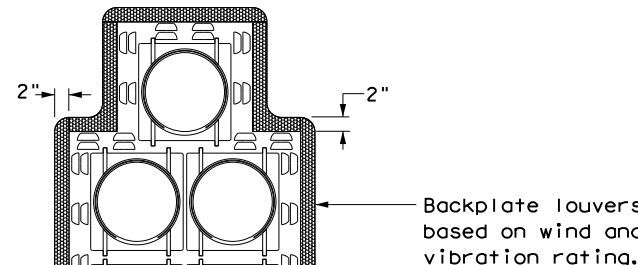
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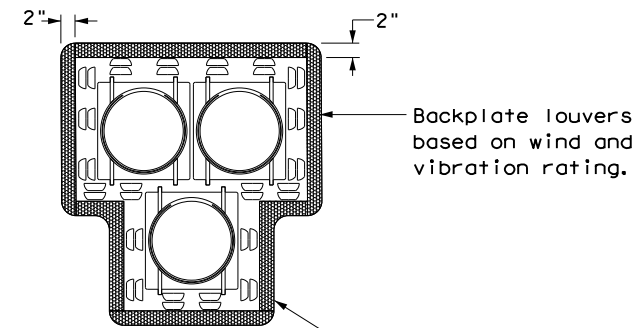
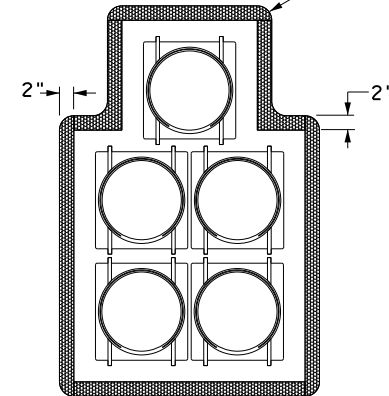
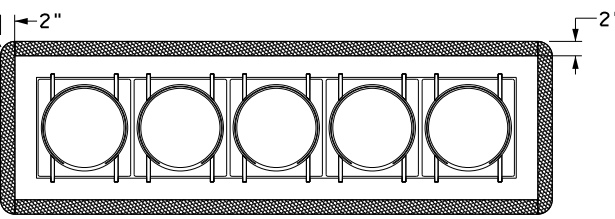
### FOUR-SECTION HEAD HORIZONTAL OR VERTICAL



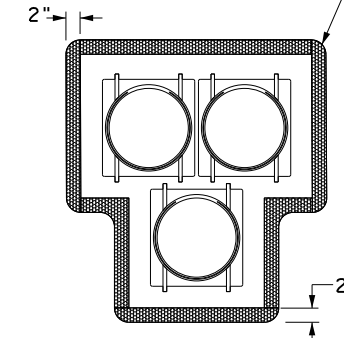
### FIVE-SECTION HEAD HORIZONTAL OR VERTICAL



### FIVE-SECTION HEAD CLUSTER




### PEDESTRIAN HYBRID BEACON



## GENERAL NOTES:

1. Backplates are optional for traffic signals and pedestrian hybrid beacons. When backplates are used, a 2-inch wide fluorescent yellow AASHTO Type B<sub>FL</sub> or C<sub>FL</sub> retroreflective border conforming to TxDOT DMS-8300 is required. Place on all approaches when used.
2. Signal head and backplate compatibility must be verified by the contractor prior to installation.
3. When using backplates on signal heads, venting is preferred to reduce cyclic vibration stress.
4. When a vented backplate is used, the retroreflective border must not be placed over the louvers.
5. This standard sheet applies to all signal heads with backplates, including but not limited to:
  - Pole mounted
  - Overhead mounted
  - Span wire mounted
  - Mast arm mounted
  - Vertical signal heads
  - Horizontal signal heads
  - Clustered signal heads
  - Pedestrian hybrid beacons

				Traffic Safety Division Standard	
<b>TRAFFIC SIGNAL HEAD WITH BACKPLATE</b>					
<b>TS-BP-20</b>					
FILE: ts-bp-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
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	DIST	COUNTY	SHEET NO.		
	ATL	BOWIE	84		

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

**1.02 REQUEST FOR INFORMATION / CLARIFICATION**

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

**1.03 PLANS / SPECIFICATIONS**

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

**PART 2 - UTILITIES AND FIBER OPTIC**

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

**PART 3 - CONSTRUCTION**

**3.01 GENERAL**

- A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.
- B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.
- C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.
- D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.
- E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.
- F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.
- G. All permanent clearances shall be verified before project closing.

**3.02 RAILROAD OPERATIONS**

- A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.
- B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. Railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.
- C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:
  - 1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.
  - 2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

**3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES**

- A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.
- B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.
- C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.
- D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
  - 1. Exactly what the work entails.
  - 2. The days and hours that work will be performed.
  - 3. The exact location of work, and proximity to the tracks.
  - 4. The type of window requested and the amount of time requested.
  - 5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.
- E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

**3.04 INSURANCE**

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

**3.05 RAILROAD SAFETY ORIENTATION**

- A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.
 

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."
- B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

**3.06 COOPERATION**

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.


**3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES**

Abide by the following minimum temporary clearances during the course of construction:  
A. 15' - 0" (BNSF) (UPRR) and 14' - 0" (KCS) horizontal from centerline of track  
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

**3.08 APPROVAL OF REDUCED CLEARANCES**

- A. Maintain minimum track clearances during construction as specified in Section 3.07.
- B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.
- C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

				<b>Rail Division</b>	
<b>RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS</b>					
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS March 2020	0046	06	082	US 82	
	DIST	COUNTY	SHEET NO.		
	ATL	BOWIE	85		

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**3.09 MAINTENANCE OF RAILROAD FACILITIES**

- A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.
- B. Perform all such maintenance and repair of damages due to the Contractor's operations at Contractor's expense.
- C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

**3.10 SITE INSPECTIONS BY RAILROAD'S DESIGNATED REPRESENTATIVE**

- A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
  1. Pre-construction meetings.
  2. Pile driving/drilling of caissons or drilled shafts.
  3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
  4. Erection of precast concrete or steel bridge superstructure.
  5. Placement of waterproofing (prior to placing ballast on bridge deck).
  6. Completion of the bridge structure.
- B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.
- C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

**3.11 RAILROAD REPRESENTATIVES**

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

- A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.
- B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.
- C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.
- D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.
- E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

**3.12 COMMUNICATIONS AND SIGNAL LINES**

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

**3.13 TRAFFIC CONTROL**

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

**3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK**

- A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".
- B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

UPRR 1-800-336-9193  
 7:00 AM to 9:00 PM CST Monday-Friday except holidays,  
 staffed 24 hrs/day for emergencies  
 48 hrs notice required

BNSF 1-800-533-2891  
 24 hour number  
 5 working days notice required

KCS 1-800-344-8377  
 Texas One Call, a 24 hour number  
 48 hrs notice required, excluding weekends and holidays

If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

- C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of 1/4 inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

**3.15 RAILROAD FLAGGING**

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

**3.16 CLEANING OF RIGHT-OF-WAY**

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

Texas Department of Transportation				Rail Division	
RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS					
FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS March 2020	0046	06	082	US 82	
DIST	COUNTY		SHEET NO.		
ATL	BOWIE		86		

DATE: 11/19/2021 9:33:11 AM  
 FILE: I:\engdata\Traffic\DG\ND192515\_Jamie\JOBS\SAFETY\_PROJECTS\CSJ\_0046-06-082\Traffic\Scope of Work.dgn  
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**I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)**

DOT #: 795838D  
 Crossing Type: \*\* AT GRADE  
 RR Company Owning Track at Crossing: TNER  
 Operating RR Company at Track: TNER  
 RR MP: 7.060  
 RR Subdivision: Bonham  
 City: Nash  
 County: Bowie  
 CSJ at this Crossing: 0046-06-082  
 Highway/Roadway name crossing the railroad: FM 2148  
 # of regularly scheduled trains per day at this crossing: 2  
 # of switching movements per day at this crossing: \_\_\_\_\_  
 % of estimated contract cost of work within railroad ROW: 0.5%

Scope of Work at this Crossing to Be Performed by State Contractor:  
Install traffic signals at intersection. Install pre-empt wire to  
railroad signal house for railroad interconnection. Tree and brush removal.

Scope of Work at this Crossing to Be Performed by Railroad Company:  
Connection and test of preempt wire. Provide protective flagging.

\*\* Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

**II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)**

Install traffic signals, install conduit, and install wire.

**III. FLAGGING & INSPECTION**

# of Days of Railroad Flagging Expected: 14

On this project, night or weekend flagging is:

- Expected
- Not Expected

Flagging services will be provided by:

- Railroad Company: TxDOT will pay flagging invoices
- Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

- UPRR - UP.info@railpros.com  
Call Center 877-315-0513, Select #1 for flagging
- BNSF - BNSF.info@railpros.com  
Call Center 877-315-0513, Select #1 for flagging
- KCS - KCS.info@railpros.com  
Call Center 877-315-0513, Select #1 for flagging  
- Bottom Line On-Track Safety Services  
bottomline076@aol.com, 903-767-7630
- OTHERS Mr. John Clements  
john.clements@gwrr.com  
PH. (580)-372-4597

Contractor must incorporate Construction Inspection into anticipated construction schedule.

- Not Required
- Required: Contact Information for Construction Inspection:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD**

On this project, construction work to be performed by a railroad company is:

- Required
- Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

**V. RAILROAD INSURANCE REQUIREMENTS**

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	\$500,000 / \$500,000 / \$500,000
Commercial General Liability	\$2,000,000 / \$4,000,000
Business Automobile	\$2,000,000 combined single limit
Railroad Protective Liability	
<input type="checkbox"/> Not Required	
<input checked="" type="checkbox"/> Non - Bridge Projects	\$2,000,000 / \$6,000,000
<input type="checkbox"/> Bridge Projects	\$5,000,000 / \$10,000,000
<input type="checkbox"/> Other	

**VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT**

On this project, an ROE agreement is:

- Not Required
- Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)
- Required: Contractor to obtain (see Item 5, Article 8.4)

With the following railroad companies: Texas Northeastern Railroad

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

<http://www.txdot.gov/inside-txdot/division/rail/samples.html>

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

**VII. RAILROAD COORDINATION MEETING**

On this project, a Railroad Coordination Meeting is:

- Not Required
- Required


See Item 5, Article 8.1 for more details.

**VIII. SUBCONTRACTORS**

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

**IX. EMERGENCY NOTIFICATION**

**In Case of Railroad Emergency**  
**Call Texas Northeastern Railroad Emergency Line**  
**at 1-800-979-4958**  
**Location: DOT 795838D**  
**RR Milepost 7.060 Bonham Subdivision**

 Texas Department of Transportation				Rail Division	
RAILROAD SCOPE OF WORK PROJECT SPECIFIC DETAILS					
FILE:	RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:
© TxDOT	June 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS		0046	06	082	US 82
3/2020		DIST	COUNTY	SHEET NO.	
		ATL	BOWIE	87	

11/19/2021 9:35:42 AM  
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**I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)**

DOT #: 795836P  
 Crossing Type: \*\* AT GRADE  
 RR Company Owning Track at Crossing: TNER  
 Operating RR Company at Track: TNER  
 RR MP: 6.710  
 RR Subdivision: Bonham  
 City: Nash  
 County: Bowie  
 CSJ at this Crossing: 0046-06-082  
 Highway/Roadway name crossing the railroad: US 82  
 # of regularly scheduled trains per day at this crossing: 0  
 # of switching movements per day at this crossing: \_\_\_\_\_  
 % of estimated contract cost of work within railroad ROW: 0.1%

Scope of Work at this Crossing to Be Performed by State Contractor:  
Install pavement markings.  
 \_\_\_\_\_  
 \_\_\_\_\_

Scope of Work at this Crossing to Be Performed by Railroad Company:  
Protective flagging.  
 \_\_\_\_\_  
 \_\_\_\_\_

\*\* Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

**II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)**

\_\_\_\_\_

**III. FLAGGING & INSPECTION**

# of Days of Railroad Flagging Expected: 1  
 On this project, night or weekend flagging is:  
 Expected  
 Not Expected  
 Flagging services will be provided by:  
 Railroad Company: TxDOT will pay flagging invoices  
 Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT  
 Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

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 Call Center 877-315-0513, Select #1 for flagging  
 BNSF - BNSF.info@railpros.com  
 Call Center 877-315-0513, Select #1 for flagging  
 KCS - KCS.info@railpros.com  
 Call Center 877-315-0513, Select #1 for flagging  
 - Bottom Line On-Track Safety Services  
 bottomline076@aol.com, 903-767-7630

OTHERS Mr. John Clements  
john.clements@gwrr.com  
PH. (580)-372-4597

Contractor must incorporate Construction Inspection into anticipated construction schedule.

Not Required  
 Required: Contact Information for Construction Inspection:  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

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No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	\$500,000 / \$500,000 / \$500,000
Commercial General Liability	\$2,000,000 / \$4,000,000
Business Automobile	\$2,000,000 combined single limit
Railroad Protective Liability	
<input type="checkbox"/> Not Required	
<input checked="" type="checkbox"/> Non - Bridge Projects	\$2,000,000 / \$6,000,000
<input type="checkbox"/> Bridge Projects	\$5,000,000 / \$10,000,000
<input type="checkbox"/> Other	

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With the following railroad companies: Texas Northeastern Railroad

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**VII. RAILROAD COORDINATION MEETING**

On this project, a Railroad Coordination Meeting is:  
 Not Required  
 Required


See Item 5, Article 8.1 for more details.

**VIII. SUBCONTRACTORS**

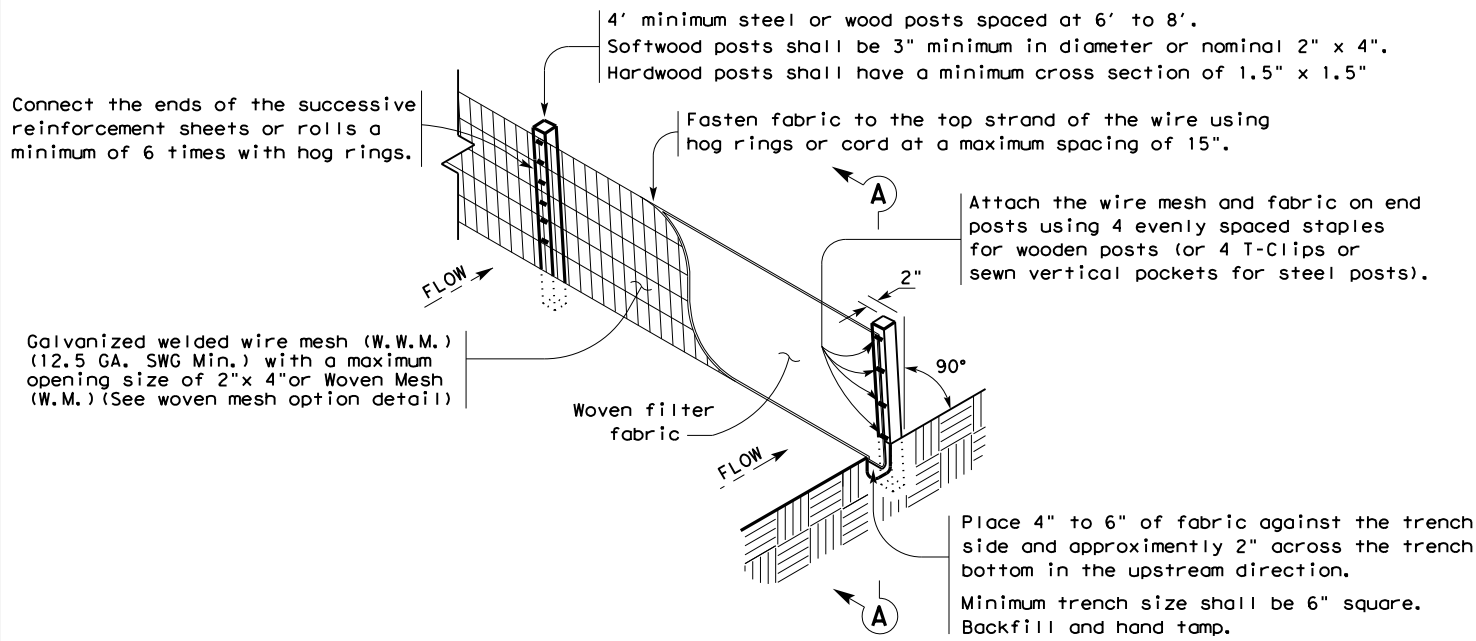
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**at 1-800-979-4958**  
**Location: DOT 795836P**  
**RR Milepost 6.710 Bonham Subdivision**

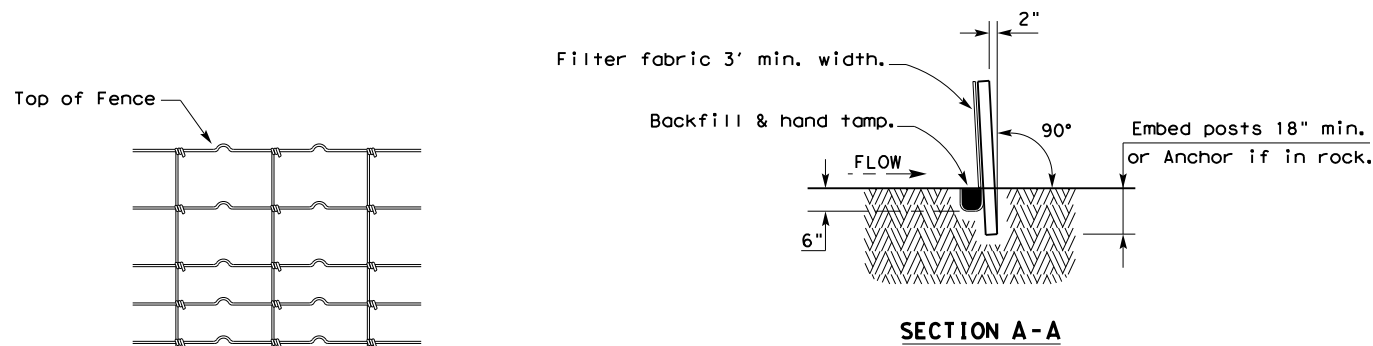
 Texas Department of Transportation				Rail Division	
RAILROAD SCOPE OF WORK PROJECT SPECIFIC DETAILS					
FILE:	RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:
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REVISIONS		0046	06	082	US 82
3/2020		DIST	COUNTY	SHEET NO.	
		ATL	BOWIE	88	

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**TEMPORARY SEDIMENT CONTROL FENCE**

SCF



**HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL**

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

**SEDIMENT CONTROL FENCE USAGE GUIDELINES**

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT<sup>2</sup>. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

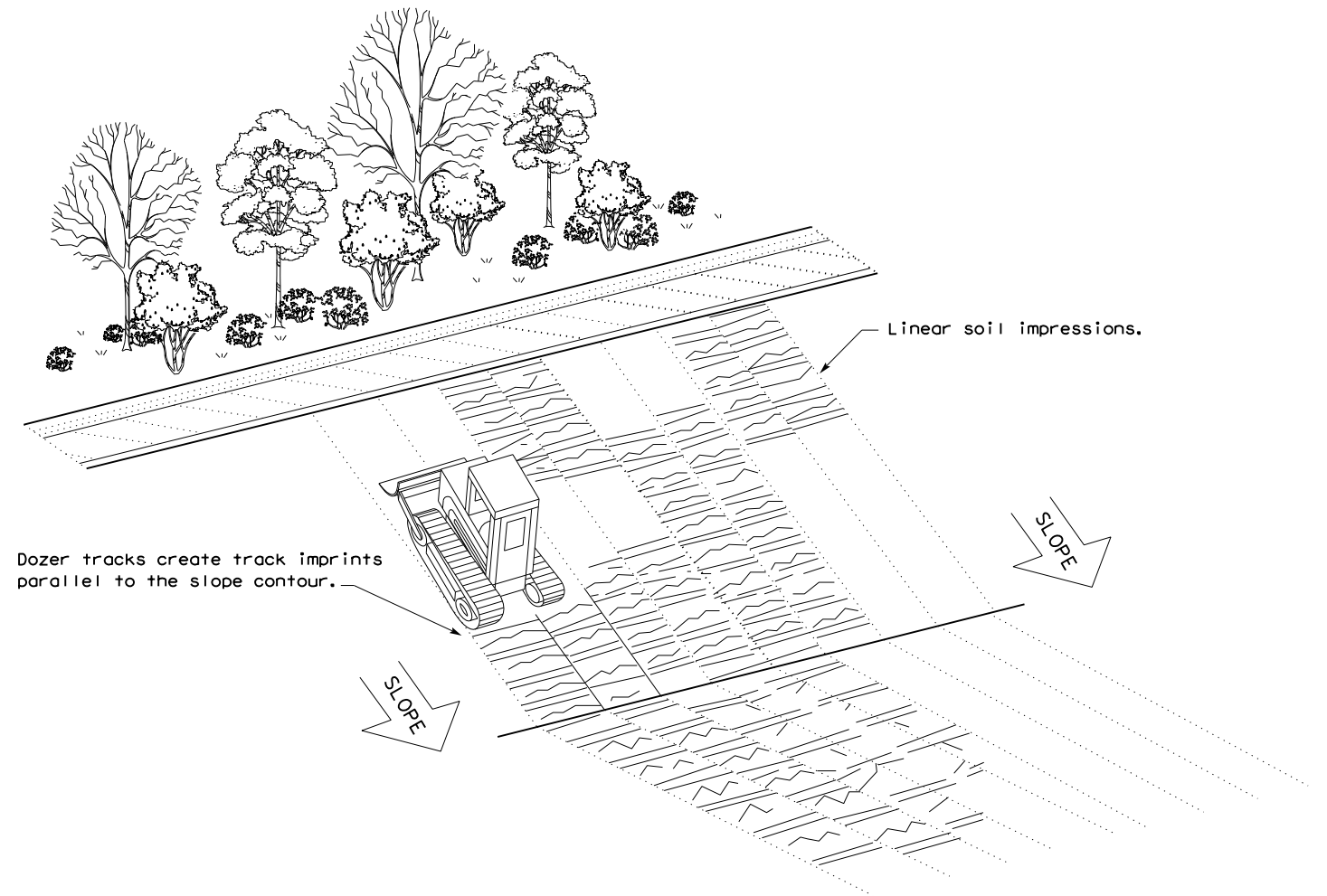
**LEGEND**

Sediment Control Fence

SCF

**GENERAL NOTES**

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



**VERTICAL TRACKING**

				Design Division Standard	
<b>TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE &amp; VERTICAL TRACKING</b> <b>EC(1) - 16</b>					
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0046	06	082	US 82	
	DIST	COUNTY	SHEET NO.		
	ATL	BOWIE	89		

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**SITE DESCRIPTION**

PROJECT LIMITS: AT THE INTERSECTION OF US 82 AND FM 2148

PROJECT DESCRIPTION: INSTALL TRAFFIC SIGNALS

MAJOR SOIL DISTURBING ACTIVITIES: PROJECT IS CONSIDERED MAINTENANCE ACTIVITY.

TOTAL PROJECT AREA: N/A

TOTAL AREA TO BE DISTURBED: 0.950

EXISTING CONDITION OF SOIL & VEGETATIVE COVER AND % OF EXISTING VEGETATIVE COVER: 90%

NAME OF RECEIVING WATERS: N/A

ANTICIPATED EFFECT OF STORM WATER ON THREATENED AND ENDANGERED SPECIES AND WILDLIFE HABITAT: REFER TO EPIC SHEET

NARRATIVE - SEQUENCE OF CONSTRUCTION (STORM WATER MANAGEMENT) ACTIVITIES:

STORM WATER MANAGEMENT: N/A

DETAILED SITE MAP OR LAYOUT INDICATING THE FOLLOWING: N/A

**EROSION AND SEDIMENT CONTROLS**

**SOIL STABILIZATION PRACTICES:**

- PERMANENT PLANTING, SODDING, OR SEEDING
- TEMPORARY SEEDING
- MULCHING
- SOIL RETENTION BLANKET
- BUFFER ZONES
- PRESERVATION OF NATURAL RESOURCES
- SLOPE TEXTURING

OTHER: EROSION CONTROL AND STABILIZATION MEASURES MUST BE INITIATED IMMEDIATELY IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED AND WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS. STABILIZATION MEASURES THAT PROVIDE A PROTECTIVE COVER MUST BE INITIATED IMMEDIATELY IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE PERMANENTLY CEASED.

**STRUCTURAL PRACTICES:**

- SILT FENCES
- HAY BALES
- ROCK BERMS
- PAVED FLUMES
- CHANNEL LINERS
- SEDIMENT TRAPS
- FILTER DAMS
- CURBS AND GUTTERS
- STORM SEWERS
- ROCK BEDDING AT CONSTRUCTION EXIT
- TIMBER MATTING AT CONSTRUCTION EXIT
- DIVERSION, INTERCEPTOR, OR PERIMETER DIKES
- DIVERSION, INTERCEPTOR, OR PERIMETER SWALES
- DIVERSION DIKE AND SWALE COMBINATIONS
- STORM INLET SEDIMENT TRAP
- VELOCITY CONTROL DEVICES
- EROSION CONTROL LOGS

OTHER: \_\_\_\_\_

MAINTENANCE: ALL EROSION AND SEDIMENT CONTROLS WILL BE MAINTAINED IN GOOD WORKING ORDER. IF MAINTENANCE IS NECESSARY, IT WILL BE DONE PRIOR TO THE NEXT RAIN EVENT IF FEASIBLE. IF MAINTENANCE PRIOR TO THE NEXT ANTICIPATED STORM EVENT IS IMPRACTICABLE, THE REASON SHALL BE DOCUMENTED IN THE SWP3 AND MAINTENANCE MUST BE SCHEDULED AND ACCOMPLISHED AS SOON AS PRACTICABLE. EROSION AND SEDIMENT CONTROLS THAT HAVE BEEN INTENTIONALLY DISABLED, RUN-OVER, REMOVED OR OTHERWISE RENDERED INEFFECTIVE MUST BE REPLACED OR CORRECTED IMMEDIATELY UPON DISCOVERY. REFER TO APPLICABLE TPDES GENERAL PERMIT FOR ADDITIONAL INFORMATION.

INSPECTION: ITEM 506 AN INSPECTION WILL BE PERFORMED EVERY 7 CALENDAR DAYS. A MAINTENANCE REPORT WILL BE MADE PER EACH INSPECTION. BASED ON INSPECTION RESULTS, THE CONTROLS SHALL BE REVISED PER THE INSPECTION REPORT.

OFFSITE VEHICLE TRACKING: THE CONTRACTOR SHALL BE REQUIRED, ON A REGULAR BASIS OR AS MAY BE DIRECTED BY THE ENGINEER, TO DAMPEN HAUL ROADS FOR DUST CONTROL, STABILIZE CONSTRUCTION ENTRANCES, REMOVE EXCESS DIRT FROM THE ROADWAY, AND COVER LOADED HAUL TRUCKS WITH TARPULIN.

CONCRETE TRUCK WASHOUT AREAS: THE CONTRACTOR WILL BE REQUIRED TO CONTAIN WASH WATER FROM CONCRETE TRUCKS AS DETAILED IN THE GENERAL PERMIT. SPECIFIC LOCATIONS MAY BE DETERMINED IN THE FIELD BUT MUST BE SHOWN ON THE SWP3 SITE MAP OR LAYOUT PRIOR TO BEGINNING CONSTRUCTION ACTIVITIES.

**WASTE MATERIALS**

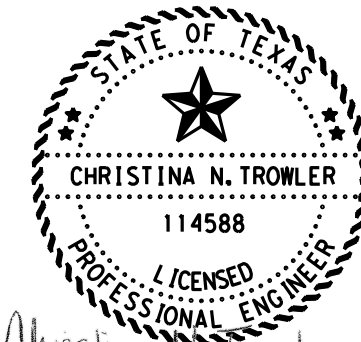
HAZARDOUS WASTE (INCLUDING SPILL REPORTING): AT A MINIMUM, ANY PRODUCTS IN THE FOLLOWING CATEGORIES ARE CONSIDERED TO BE HAZARDOUS: PAINTS, ACIDS FOR CLEANING MASONRY SURFACES, CLEANING SOLVENTS, ASPHALT PRODUCTS, CHEMICAL ADDITIVES FOR SOIL STABILIZATION, CONCRETE CURING COMPOUNDS AND ADDITIVES OR MOTOR OIL. MATERIALS SHALL BE STORED IN ACCORDANCE WITH APPLICABLE REGULATIONS. IN THE EVENT OF A SPILL WHICH MAY BE HAZARDOUS, IMMEDIATELY REPORT SPILL IN ACCORDANCE WITH STATE AND LOCAL REGULATIONS.

WASTE MATERIALS: THE BURYING OF CONSTRUCTION WASTE MATERIAL ON SITE WILL NOT BE PERMITTED. DISPOSAL OF WASTE MATERIALS SHALL MEET ALL STATE AND LOCAL SOLID WASTE MANAGEMENT REGULATIONS. WASTE MATERIALS STORED ON SITE SHALL BE COLLECTED IN A METAL DUMPSTER WITH A LOCKING, SECURE COVER AND A DRAIN PLUG IN PLACE.

SANITARY WASTE: ALL SANITARY WASTE WILL BE DISPOSED OF IN ACCORDANCE WITH ALL STATE AND LOCAL REGULATIONS. SPECIFIC LOCATIONS OF PORTABLE UNITS MUST BE SHOWN ON THE SWP3 SITE MAP OR LAYOUT.

REMARKS: DISPOSAL AREAS, STOCKPILES, AND HAUL ROADS SHALL BE CONSTRUCTED IN A MANNER THAT WILL MINIMIZE AND CONTROL THE AMOUNT OF SEDIMENT THAT MAY ENTER RECEIVING WATERS. DISPOSAL AREAS SHALL NOT BE LOCATED IN ANY WETLAND, WATERBODY OR STREAMBED. CONSTRUCTION STAGING AREAS AND VEHICLE MAINTENANCE AREAS SHALL BE CONSTRUCTED BY THE CONTRACTOR IN A MANNER TO MINIMIZE THE RUNOFF OF POLLUTANTS. ALL WATERWAYS SHALL BE CLEARED AS SOON AS PRACTICAL OF TEMPORARY EMBANKMENT, TEMPORARY BRIDGES, MATTING FALSEWORK, PILING, DEBRIS OR OTHER OBSTRUCTIONS PLACED DURING CONSTRUCTION OPERATIONS THAT ARE NOT A PART OF THE FINISHED WORK.

NOTES: THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL SUBCONTRACTORS ARE AWARE OF AND COMPLY WITH ALL COMPONENTS OF THE SWP3.



Christina N. Trowler, P.E.

11/30/2021

Texas Department of Transportation  
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**TxDOT STORM WATER POLLUTION PREVENTION PLAN**

**SWP3**

FILE: swp3less1acre.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CR: TxDOT	
Revisions		CONT	SECT	JOB	HIGHWAY
May 2017		0046	06	082	US 82
		DIST	COUNTY	SHEET NO.	
		ATL	BOWIE	90	



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DATE: DATE TIME  
 FILE: DOCUMENT NAME

**I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402**

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1. There are no MS4 Operators in the project area.

2.  No Action Required  Required Action

Action No.

1. This project is considered a maintenance activity and is exempt from the requirements of TPDES TXR 150000.

Commitment No.

1. Refer to the SWP3 Plan Sheet, BMPs, and Detail. It will address sweeping, chemical storage, sanitary waste, and all other management practices.

**II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404**

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# \_\_\_\_\_

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1.
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

**III. CULTURAL RESOURCES**

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

**IV. VEGETATION RESOURCES**

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

**V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.**

No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

**LIST OF ABBREVIATIONS**

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SWSP: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

**VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES**

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used. Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- \* Dead or distressed vegetation (not identified as normal)
- \* Trash piles, drums, canister, barrels, etc.
- \* Undesirable smells or odors
- \* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

Yes  No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

Yes  No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.


**VII. OTHER ENVIRONMENTAL ISSUES**

(includes regional issues such as Edwards Aquifer District, etc.)

No Action Required  Required Action

Action No.

- 1.
- 2.
- 3.

 Texas Department of Transportation		Design Division Standard		
<h2>ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC</h2>				
FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS	0046	06	082	US 82
05-07-14 ADDED NOTE SECTION IV.	DIST	COUNTY	SHEET NO.	
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	ATL	BOWIE	91	